CIVAUX
ELECTRIC

C-PF12X

INTELLIGENT POWER FACTOR CONTROLLER

OPERATION'S MANUAL
Rev. 1.1



- ACCURATE MEASUREMENT
- RELIABLE PERFORMANCE
- SMART CONTROL

POWERING EFFICIENCY.
DRIVING PERFORMANCE.

DISCLAIMER



HIGH VOLTAGE

Hazardous voltage can cause death or serious injury.



TRAINED PERSONNEL

Only qualified personnel should install, operate or service this equipment.



TRAINED PERSONNEL

Risk of electric shock. Follow all safety instructions.

GENERAL INSTRUCTIONS

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

TECHNICAL ASSISTANCE

Should further information be desired, or should problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to **CIVAUX ELECTRIC** office.

WARRANTY

The contents of this Operations Manual shall not become part of or modify any prior or existing agreement or relationship. The sales contract contains the entire obligations of **CIVAUX ELECTRIC.** The warranty contained in the contract between the parties is the sole warranty of **CIVAUX ELECTRIC.** Any statements contained herein do not create new warranties or modify the existing warranty.

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DANGER

Hazardous voltage can cause death or serious injury. Disconnect power, Short CT circuits & allow minimum three minutes wait period before accessing equipment.

ESD SENSITIVE DEVICE

Electrostatic Discharge Sensitive Product Handle with adequate care.



Recyclable Product

RoHS compliant

No Battery usage

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Document Revision Reference

Revision	Date	Addition / Subtraction / Modification brief
Rev 1.	24th April 2026	Original document release.

01 Abbreviations

The following symbols and abbreviations are used throughout this manual.

Electrical	
P	Active Power RMS, total of 3 phases.
P1	Active Fundamental Power, total of 3 phases.
Q	Reactive Power RMS, total of 3 phases.
Q1	Reactive Fundamental Power, total of 3 phases.
S	Apparent Power RMS, total of 3 phases.
S1	Apparent Fundamental Power, total of 3 phases.
D	Total 3-phase Distortion Power.
DX	Total 3-phase Cross Distortion Power.
Ph+	Active Energy Consumption RMS.
P1h+	Active Energy Consumption Fundamental.
Ph−	Active Energy Generation RMS.
P1h−	Active Energy Generation Fundamental.
Qh+	Reactive Energy Import RMS.
Q1h+	Reactive Energy Import Fundamental.
Qh−	Reactive Energy Export RMS.
Q1h−	Reactive Energy Export Fundamental.
Sh	Apparent Energy RMS.
S1h	Apparent Energy Fundamental.
PF	Overall 3-phase RMS Power Factor.
DPF	Overall 3-phase Fundamental (Displacement) Power Factor.

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LL	Line to Line.
LN	Line to Neutral.
RTU	Remote Terminal Unit.
BPS	Baud per Second (serial communication speed).
RTD	Resistance Temperature Detector.
LV	Low Voltage.
HV	High Voltage.
General	
i.t.o.	in terms of.
e.g.	**for an example.**
POV	point of view.

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PART ONE

Product

Model identification, ordering matrix, feature set and full technical specifications for the C-PF12X intelligent power factor controller.

02 Product Information

Model name	C- PF12X
Sub-types	C- PF12X- 12K1NMNO · - 06K1NMNO · - 12K1NNNO · - 06K1NNNO
Release date	1st February 2026
Latest version	02. 02. 0018 Dated 23rd April 2026
Product category	Electronic Instrumentation & Electrical Measurement & Control
Usage directive	Low Voltage (LV) Directive (< 1000 Vac). Category III (Indoor Industrial). Pollution Category II.

STANDARDS COMPLIANCE

✓ CE · ✓ RoHS · ✓ Environmental · ✓ Measurement accuracy · ✓ Safety · ✓ EMC / EMI · ✓ Transportation & Storage

Intended Use

Instrument for controlling the Power Factor of an electrical supply system by switching the reactive-power generating components such as capacitors and inductors. It is intended to be used as an intelligent control device in Automatic Power Factor Improvement electrical panels. Multiple functionalities are intended:

- **Primary function:** applicability with LV or HV electrical supply & distribution systems — controlling the fundamental reactive power by switching capacitor banks.
- **Secondary function:** monitoring and communicating the electrical measured parameters and capacitor health with IoT functionality (as per sub-types).
- **Additional function:** providing add-on protection to the Power Factor Correction system with various abnormality detection.

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ADDITIONAL DISCLAIMER

The product cannot be construed as a "Protection Relay". Protection-relay standards are not applicable to it. The intent of the Additional Function is "add-on protection".

DECOMMISSIONING

The product is to be disposed of for plastic and electronics-parts recycling. The product is RoHS compliant. It should be broken off to guard against sharp edges. Batteries are not used in this product and it does not require special recycling needs.

03 Product Selection

Select the sub-type according to the number of switching steps and whether RS-485 MODBUS communication is required.

Order code	Steps	Switching	CT feedback	Aux I/O	Communication
C- PF12X- 12K1NMNO	12	Contactor	1 CT	1 AI, 1 AO	RS-485 MODBUS
C- PF12X- 06K1NMNO	06	Contactor	1 CT	1 AI, 1 AO	RS-485 MODBUS
C- PF12X- 12K1NNNO	12	Contactor	1 CT	1 AI, 1 AO	—
C- PF12X- 06K1NNNO	06	Contactor	1 CT	1 AI, 1 AO	—

Note: the Auxiliary Output can be configured as an additional step for capacitor control.

04 Features

- ✓ Accurate Power Factor (Displacement PF).
- ✓ 13 outputs (12 + 1 Aux) for the 12K1 model, or 7 (6 + 1 Aux) for the 06K1 model, for capacitive banks.
- ✓ Electromechanical relay contacts — "NO" 250 V~ 0.5 A inductive for AC-6b capacitor-duty contactors.
- ✓ Capacitive bank KVAR-value health detection through on-line operational monitoring.

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- ✓ Auxiliary input with "AC voltage value" measurement — control-voltage health monitoring, capacitive-bank tripping and avoidance of contactor chatter for reliability. Input may also be configured as digital "1" & "0" commands.
- ✓ One auxiliary output for various alarm and user-selectable control functions.
- ✓ Harmonics measurement (odd & even) up to the 31st harmonic for voltage and current (V-THD%, V-THD-Volt, A-THD%, A-TDD%).
- ✓ Four-quadrant measurement — highly suitable for co-generation with solar or wind power.
- ✓ Class-1.0 accuracy for fundamental Active / Reactive Power.
- ✓ Measurement configurations: 2(LL)wires-1CT, 2(LN)wires-1CT.
- ✓ Wide-range voltage (50 V~LN to 550 V~LL) and current measurement (0% to 150% of rated value).
- ✓ Suitability for LV & HV measurement plus LV or HV capacitive-bank control.
- ✓ RS-485 for MODBUS RTU / ASCII (selected sub-types).
- ✓ High-reliability wide-range auxiliary power for unit energizing with AC or DC voltage input.
- ✓ Automatic & manual synchronization of voltage & current feedback — no physical wiring change.
- ✓ Shrouded high-quality terminals for electrical connection, catering to human-safety needs.
- ✓ Fire-retardant housing with IP-54 front-side and IP-30 back-side enclosure protection.
- ✓ Add-on functions: capacitive-bank utilization, maximum-demand detection, annunciation / load trip, remote (REM1, REM2) measurement, 17 backup protections.
- ✓ Supply Voltage–Current (V-A) measurement-feedback phasor-angle-shift selection, for V and I sensing on two different (HV / LV) sides of the distribution transformer.

05 Specifications

Electrical Characteristics

Sub-function	Parameter / condition	Minimum	Maximum

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Sub-function	Parameter / condition	Minimum	Maximum
Unit Energizing — Supply Voltage input (Category III)			
AC supply	50 Hz or 60 Hz (±5 Hz), two-wire supply	90 V– (functional) · 0 V– (abs. min)	485 V– (functional) · 550 V– (abs. max)
DC supply	Max. ripple ≤2.5% peak of average	100 V-dc (functional) · 0 V-dc (abs. min)	550 V-dc (functional) · 600 V-dc (abs. max)
AC VA consumption	90–485 V~, metering	2.5 VA	7.5 VA
AC VA consumption	With maximum control loading	4.5 VA	15.0 VA
DC VA consumption	100–550 V-dc, metering	2.5 VA	7.5 VA
DC VA consumption	With maximum control loading	4.5 VA	15.0 VA
Supply Measurement Input			
Supply Voltage (V), sinusoidal	3-Phase & Neutral — fundamental	50 V~ L-N	315 V~ L-N
Supply Voltage (V), sinusoidal	3-Phase (3-wire) — fundamental	85 V~ L-L	550 V~ L-L
Supply Voltage (V), sinusoidal	2-Phase (Ph-2 & Ph-3)	85 V~ L-L	550 V~ L-L
Supply Voltage (V), sinusoidal	1-Phase (Ph-1 & Neutral)	50 V~ L-N	315 V~ L-N
Current (I), sinusoidal	5 A~ range — fundamental / sensitivity	75 mA · 5 mA sensitivity	7.5 A~
Current (I), sinusoidal	1 A~ range — fundamental / sensitivity	15 mA · 1 mA sensitivity	1.5 A~
Frequency (Hz)	Nominal 47–53 Hz (50 Hz) / 57–63 Hz (60 Hz)	45 Hz	65 Hz
VA burden	Voltage at 550 V~ L-L	<1.13 VA per ph., <3.40 VA total 3-ph	
VA burden	Voltage at 415 V~ L-L	<0.65 VA per ph., <1.95 VA total 3-ph	
VA burden	Current at 7.5 / 5.0 / 1.0 A~ 5-CT	<1.0 / <0.5 / <0.05 VA per ph.	
Accuracy	Supply Voltage / Current	V~: Class 1.0 · A~: Class 1.0	
Accuracy	Supply frequency (fund. voltage)	f (Hz): 0.05% measurement accuracy	
Accuracy — Power / Energy	IEC-62053 pt.21 & 24, 4-quadrant	5 A & 1 A range: Class-1S (P1 & Q1)	
Calculated Values from Supply Measurement			

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Sub-function	Parameter / condition	Minimum	Maximum
Maximum Demand	KVA & KW (1-min sliding window)	Window 5 minutes	Window 60 minutes
Harmonics	Voltage (L-L & L-N) and Current	Spectrum: 2nd to 31st harmonic	
Capacitive Steps — On-line Monitoring & Control			
Bank VAR measurement	Normalized value at rated voltage & frequency	Accuracy 10% (larger) / 20% (medium–small); extra-small banks may be hampered	
PF correction — Target PF	Displacement P.F. setting	Inductive: 0.000	Capacitive: 0.000
VAR margin	Small-step capacitive VAR × multiplier	×1.1	×9.9
Offset to target	% above the target PF setting	0%	100%
ON/OFF control	Algorithm: optimal value to target	Single target PF with adjustable No-action VAR tolerance band	
Bank utilization	Limit = (switch-ON count / C) + (ON minutes / T)	C = 01 ("00" disable) · T = 01 ("00" disable)	C = 99 · T = 99
Contactor command	Relay "NO" contacts	0.5 A ind. @ 250 V~ · 0.5 A ind.+res. @ 24 V-dc	
Auxiliary Functions			
Auxiliary Input (Voltage~)	AC input (abs. max rating)	0 V~	300 V~
Auxiliary Input (Voltage~)	AC measurement range	68 V~	290 V~
Auxiliary Input (Voltage~)	Digital range	0 (Zero): <3 V~	1 (One): >68 V~
Auxiliary Output	NO contact, galvanically isolated	0.5 A inductive · 250 V~ contact rating	
Internal unit temperature	MCU temperature	0 °C	+65 °C
IoT Functionalities (only for nnK1NMNO sub-types)			
Communication (RS-485)	Protocol & data download	MODBUS (RTU / ASCII), PC-App data D/L	
Baud rates	As per user settings	4.8, 9.6, 19.2, 38.4, 57.6 kbps	
Bits parity	Parity bit, user set	None, Odd & Even	

Enclosure / Display / Keyboard / Connectors

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Item	Parameter	Value
Enclosure	Type	Fire-retardant ABS grade
Dimensions	Front facia × depth	146 (H) × 146 (W) × 75 (D) mm
Dimensions	Panel cut-out	138 × 138 mm (±0.3 mm)
Weight	Unpacked / packed	<0.9 kg (incl. clamps) / ≤1.25 kg
Display	LCD backlit	Yellow-green with LED backlit, 16 graphic characters × 2 lines
Contrast / view	Adjust min–max (25 key presses)	Left key: darker · Right key: lighter
Keyboard	Isolated tact switch, 7 keys	Up / Down / Left / Right (navigation), Enter (confirm), Selection (mode & parameter), Save
Connectors	Shrouded fork-lug screw terminals	Voltage 7.62 mm · Current S-CT 6.35 mm · Step control & aux I/O 7.62 mm · Aux supply 7.62 mm
Connectors	Plug-socket (nnK1NMNO)	Communication 3.81 mm pitch, pin-type lugs

Recommended Environmental Conditions

Sub-function	Parameter / condition	Minimum	Maximum
Operating			
Temperature	Ambient at back-side terminals area	0 °C	+60 °C
Humidity	Non-condensing	10% RH	95% RH
Altitude	With respect to normal sea level	–10 m	2000 m
Usage	Stationary electrical panel in electrical room / area	Indoor; no direct exposure to sunlight / rain / conductive extra-fine dust	
Galvanic isolation	Supply & measurement terminals w.r.t. body	3 kV~ / 1 min / 3 mA trip · >50 MΩ with 1000 Vdc megger	
Pollution	Non-conductive	Degree of pollution = 2	
Storage			
Temperature	Ambient on packed unit	–10 °C	+70 °C
Humidity	Non-condensing	5% RH	90% RH
Time of non-usage	Power-up for min. 15 min within non-usage time	Maximum 12 months of non-usage	

Standards Compliance

Standard	Scope	Status

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Standard	Scope	Status
IEC 61326-1	EMC — Electromagnetic Compatibility; EMI — Electromagnetic Interference	Compliance
IEC 61010-1	Safety standards with Low-Voltage instruments directive (Category III — industrial indoor)	Compliance
RoHS 2.0	2002/95/EC — regulation on hazardous-substances usage	Compliance
CE	Holistic self-declared standards	Compliance
IEC 60068-2	Dry heat (storage +70 °C / 72 h); Cold (storage −25 °C / 72 h); Damp-heat cyclic (RH 93%, +40 & +25 °C, 12–12 h, 144 h)	Compliance
IEC 60529	Front part outside face — IP54; back side inside panel — IP30	Compliance
IEC 62053-21	Active energy accuracy Class 1 (P and P-hr, in measured phase) — table 6 & 7	Compliance
IEC 62053-24	Reactive energy accuracy Class 1 (Q and Q-hr, in measured phase) — table 6 & 7	Compliance

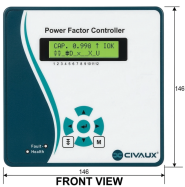
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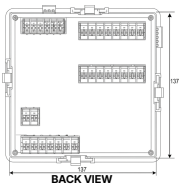
PART TWO

Installation & Wiring

Mechanical mounting, terminal layout, electrical-connection safety, powering-up and supply voltage / current measurement feedback.

06 Mechanical Dimensions





Front view and back view — overall dimensions 146 × 146 mm, internal frame 137 × 137 mm.

PANEL CUT-OUT

The door cut-out recommended is **138 × 138 MM (±0,3 MM)** for mounting the C-PF12X.

07 Installation Requirements

Assembly, Location and Mounting

The unit is intended for indoor electrical-panel installation. It is to be assembled on the front part of the Power Factor Correction electrical panel — specifically on the front panel door — with its location kept suitable for easy human observation.

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The front panel door cut-out is square, 138 × 138 mm. The door surface around the cut-out should be even and level, recommended to be within ±0.3 mm. This ensures IP-54 enclosure compatibility.

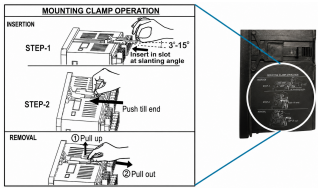


FIG 7. 1 Mounting-clamp operation — insertion at a 3°–15° slanting angle, push to end, and removal sequence.

MOUNTING ON THE PF-CORRECTION PANEL DOOR

- ✓ Remove the right-hand side plug terminal (communication, for nnK1NMNO).
- ✓ Remove the 4 clamps as per the instruction above.
- ✓ Insert the C-PF12X unit from the front of the panel door. Insert and secure the mounting clamps as per the instructions above.
- ✓ Put back both plug terminals.

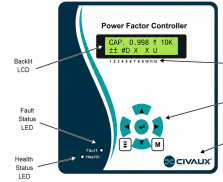
i **VENTILATION & ELECTRICAL CLEARANCES**

Once mounted on the panel door, the back-side clearances are minimum 5 cm on all 4 sides (top, bottom, left & right) and 10 cm clearance from the back-side terminals.

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Operational Parts

Front View:



Back View:

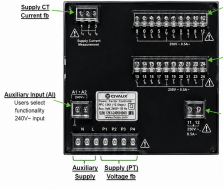


FIG 7.2 Front view — backlit LCD, capacitor-bank step numbers, soft-touch 7-key keypad, and Fault / Health status LEDs.

FIG 7.3 Back view — Supply CT current feedback, capacitor control relay sets (1st & 2nd), Auxiliary Input / Output, Auxiliary Supply and Supply (PT) voltage feedback terminals.

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FIG 7.4

Right-side view — serial communication terminal block COM-2: RS-485 (only for nnK1MNO).



PLUG-SOCKET CONNECTOR

The communication terminal is plug-socket type. While mounting on the panel door, this connector is to be removed before the unit is inserted into the panel cut-out. After mounting the unit, this connector should be replaced back.

Electrical Connections — Safety Requirements

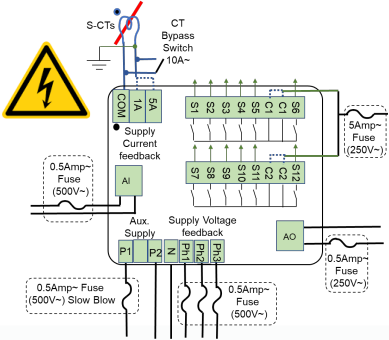


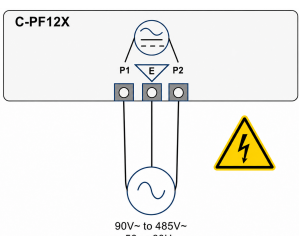
FIG 7.5 Complete terminal-connection and protection scheme — CT bypass switch, fusing and feedback wiring.

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- **CT feedback of supply-system current:** 10 A~ duty shorting switches; common terminal to power earth.
- **Auxiliary supply:** connected to P1 & P2 terminals — AC 90 V~ to 485 V~ or DC 100 V to 550 V, through ceramic 500 V fuses, 0.5 A slow-blow type.
- **Capacitor switching common points C1, C2:** 100 V~ to 250 V~, through glass-cartridge 250 V~ fuses, 5 A rating.
- **Measurement supply voltage:** connected to Ph1, Ph2, Ph3 terminals through ceramic 500 V fuses, 0.5 A.
- **Auxiliary input terminals:** through ceramic 500 V fuses, 0.5 A.
- **Auxiliary output terminals:** through ceramic 250 V fuses, 0.5 A.

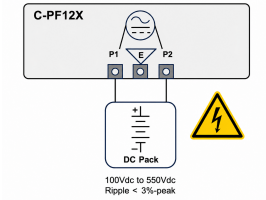
08 Interconnection to Accessories

AC source Power Up connection



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DC source Power Up connection :



DC source power-up — 100 Vdc to 550 Vdc, ripple <3%-peak.

POWER-UP RATING

The unit powering-up connection has a recommended rating of >25 VA. The "E" terminal is normally left open but can be connected to an isolated electronic earth in a high electromagnetic-interference environment.

09 Supply Voltage & Current Measurement

Connections are made for Low Voltage (up to 550 V~ L-L) supply or, via Potential Transformers, for High Voltage supply. The measurement configuration (3 or 4) is selected to match the wiring scheme.

Configuration	Description	Availability
LV — Config 3 Quadrature V-A	Measures one-phase current and voltages Line-Line across two phases. Suitable for balanced loaded systems.	Default — configurable in Easy Edit & Expert Edit
LV — Config 4 In-Phase V-A	Measures one-phase current and voltage Phase-to-Neutral. Suitable for balanced loaded systems.	Expert Edit only
HV — Config 3 Quadrature V-A	Measures one-phase current and voltages Line-Line across two phases through a Potential Transformer (PT).	Expert Edit only

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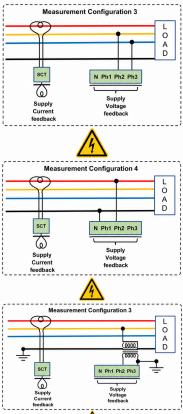


FIG 9.1 Measurement-feedback wiring for LV (configurations 3 & 4) and HV (configuration 3, via PT).

Additional Care — S-CT Selection & Wiring

- Check that the supply-current measurement S-CT primary P1–P2 are inserted with the correct electrical polarity.
- Check that the S-CT secondary S1–S2 are connected on the C-PF12X terminals with S1 always connected to the common-point terminal with dot polarity.

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- Check the S-CT secondary rated current value — 5 A~ or 1 A~. Put the S2 terminal on the C-PF12X S-CT terminal marked 5A or 1A respectively (5A for 5 A, 1A for 1 A).
- Never use an S-CT primary current rating far higher than the maximum current of the supply system — this reduces measurement accuracy and can give errors in capacitor mitigation.
- Never use a protection-class CT for measurement feedback; PF-correction results can be error-prone.
- Note that the accuracy of capacitor-bank reactive-power measurement is lower (refer to the specifications). Values are updated after multiple switching operations — typically a stable value after about 10 switching operations.
- Always use a current-feedback measurement-class CT of 0.5 class or better, with a minimum VA rating of 3 VA or more, as per the electrical distance of the CT from the C-PF12X.
- Ensure CT shorting-terminal provision is made in the wiring. An open secondary CT can generate extremely high voltages that are prone to human shock hazards, even when the PF-correction system is powered down.
- Power-earthing of the PF-correction system should be connected to one end of the CT secondary — again for human safety and prevention of shock hazards.

SHOCK HAZARD — OPEN CT SECONDARY

An open secondary CT can generate lethal voltages. Always provide CT shorting terminals and earth one end of the CT secondary.



10 Reactive Elements Switching Control

The C-PF12X switches capacitor banks through electromechanical relay contacts. RC snubber circuits (C = 0.1 µF, R = 22 Ω) are fitted across the capacitor-duty contactor coils; for HV switching, snubbers are also fitted across the intermediate buffer-relay coils.

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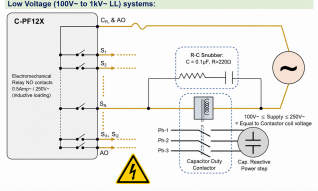


FIG 10. 1 Low Voltage systems (100 V~ to 1 kV~ L-L) — direct capacitor-duty contactor switching with RC snubber.

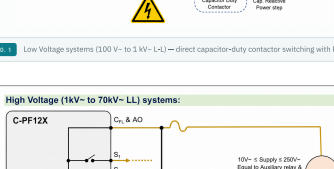
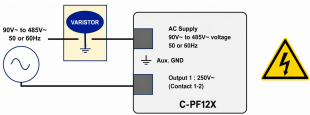


FIG 10. 2 High Voltage systems (1 kV~ to 70 kV~ L-L) — intermediate auxiliary relay driving a vacuum capacitorduty contactor.

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11 Auxiliary Input

Digital Input



Auxiliary digital input

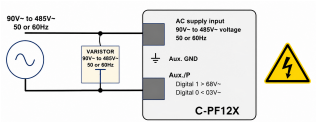
FIG 11-1 Digital input — absolute maximum range 0 V~ to 300 V~.

- Digital 1 is sensed when the AC supply across the Aux. I/P terminals is greater than 68 V~.
- Digital 0 is sensed when the AC supply across the Aux. I/P terminals is lower than 3 V~.

AC INPUT ONLY

Auxiliary-input terminals are designed to measure and understand AC voltage input. The auxiliary supply input is not designed to handle DC voltages.

AC Voltage Measurement & Monitoring Input



Auxiliary AC voltage monitoring input

FIG 11-2 AC voltage measurement & monitoring — range 68 V~ to 290 V~.

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The measurement & monitoring of AC voltage (mains supply frequency 50 Hz or 60 Hz) is used for control-AC-voltage monitoring. This ensures reliable operation and protection of the control circuitry when the control AC supply deviates away from the healthy limit prescribed.

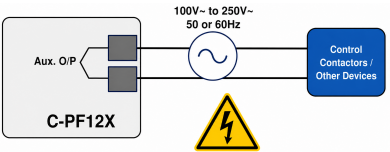
In case of distortion on voltage (harmonics presence), the measurement accuracy can get hampered. The provision in user settings for AC-voltage calibration should be used to attain accuracy.

1.2 Auxiliary Output

There is one auxiliary output. The output is an isolated normally-open (NO) electromechanical contact with the following ratings:

- 250 V~ voltage withstanding
- 24 V-dc voltage withstanding
- 0.5 A (AC & DC) inductive current
- 5.0 A-ac resistive current
- 1.0 A-dc resistive current

Normally the auxiliary-output contacts have multiple functionalities, which are elaborated in further parts of this manual.

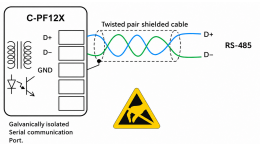


Auxiliary output connection

FIG 12.1 Normal connection method for relay-type outputs.

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Serial Communication



RS-485 serial communication wiring

FIG 13.1 Galvanically-isolated RS-485 serial communication port with twisted-pair shielded cable.

CABLE LENGTH

Recommended maximum length for RS-485 shielded cable is 500 metres. For higher lengths, RS-485 repeaters / boosters must be incorporated. Cable-termination resistors and pull-up resistor values are critical for longer cable lengths for reliable communication.

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PART THREE

Application Configurations

Schemes by voltage / current feedback position and capacitor-bank location, special system configurations, and digital-communication methodologies.

14 Application Configurations

Prominent configurations catered for by the C-PF12X are organised as follows:

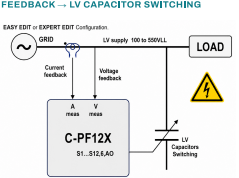
1. Based upon the Voltage–Current feedback position and the capacitor-switching position.
2. Based upon the need for differently configured schemes.
3. Digital-communication methods.

A · Volt-Amp Feedback & Capacitor-Bank Position

With these application configurations, the measurement configurations (3, 4) can follow the selected wiring scheme.

1 · LV CURRENT – LV VOLTAGE FEEDBACK → LV CAPACITOR SWITCHING

Easy Edit or Expert Edit



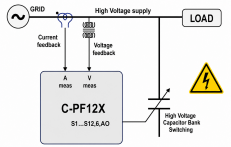
Scheme 1

FIG. 14. 1 LV current and LV voltage feedback with LV capacitor switching.

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2 · HV CURRENT – HV VOLTAGE FEEDBACK → HV CAPACITOR SWITCHING

Measurement config 3 · Expert Edit

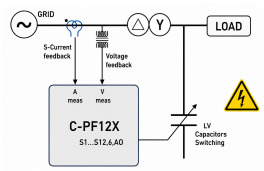


Scheme 2

FIG 14. 2 HV current and HV voltage feedback (via PT/CT) with HV capacitor-bank switching.

3 · HV CURRENT – HV VOLTAGE FEEDBACK → LV CAPACITOR SWITCHING

Measurement config 3 · Expert Edit



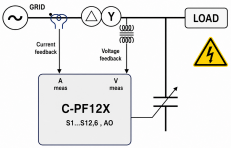
Scheme 3

FIG 14. 3 HV feedback through a delta-wye transformer with LV capacitor switching.

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4 · HV-SIDE CURRENT – LV VOLTAGE FEEDBACK → LV CAPACITOR SWITCHING

Measurement config 3 & 4 · Expert Edit



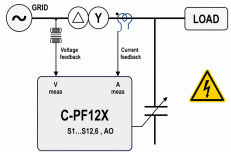
Scheme 4

FIG. 14. 4 HV-side current with LV voltage feedback and LV capacitor switching.

User settings need special configuration with transformer primary-to-secondary vector relationships. In this scheme the PT for voltage feedback need not be used if the voltage feedback is <550 V~ L-L.

5 · HV VOLTAGE – LV-SIDE CURRENT FEEDBACK → LV CAPACITOR SWITCHING

Measurement config 3 · Expert Edit



Scheme 5

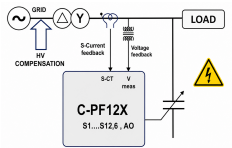
FIG. 14. 5 HV voltage with LV-side current feedback and LV capacitor switching.

User settings need special configuration with transformer primary-to-secondary vector relationships.

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6 · LV CURRENT – LV VOLTAGE AND HV MITIGATION → LV CAPACITOR SWITCHING

Measurement config 3 & 4 · Expert Edit



Scheme 6

FIG 14.6 LV feedback with reactive-power mitigation reflected to the HV side of the transformer.

This special feature mitigates D-PF on the HV side of the supply-system transformer. The C-PF12X is configured with the transformer series / shunt impedance data; it monitors the reactive components (series and shunt) and mitigates the reactive power Q (VAR) on the LV side to ensure correct mitigation on the HV side.

This feature requires transformer data such as rating, %Z transfer impedance and no-load LV reflected current %. These parameters are programmed in the User configuration. It avoids separate installation of expensive HV-side CT / PT units — a convenient and effective method for HV mitigation.

APPLICATIONS

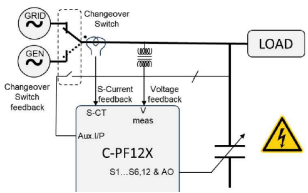
Applications Category

Differently Configured Schemes

1. Grid and Generator Supply changeover connectivity.
2. Remote metering with control by Remote Mode (REM1).
3. Two PFC system connected through Bus-Coupler with reactive power sharing.
4. Scheme with Co-Generation like Solar and Wind Power.

1 Grid & Generator Supply changeover connectivity

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C-PF12X "auxiliary input" user setting (EXPERT EDIT) needs configuration. Additionally, the two target power factor settings are to be ensured. One for grid supply target PF and another for generator supply target PF.

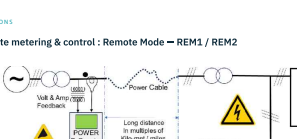
The stand-alone generators need to work within the specified range of power factor. The range is normally on inductive power factor side and ranges between 0.70-ind to 0.95-ind. Outside the given range, the stability is lost. Therefore, the generator manufacturer recommends the specific load target power setting (typically 0.85 or 0.90).

The grid supply demands the power factor near unity (minimizing on transmission & distribution losses). Therefore, the target power factor requirement is near unity.

The above scheme allows automatic change of TARGET PF settings when unit is working on Grid, and the unit is on Generator.

APPLICATIONS

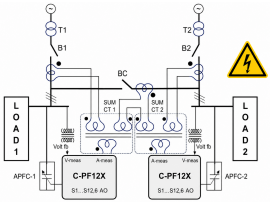
2 Remote metering & control : Remote Mode — REM1 / REM2



The "REM1" MODBUS communication mode is to be enabled on the user settings. In case the remote measurement meter has communication mode other than RS-485 MODBUS, then the appropriate type of MODBUS converter needs to be installed external to C-PF12X unit.

The "REM2" MODBUS communication mode is enabled for direct capacitor control from a remote MODBUS master that controls the switching of Capacitor banks directly. C-PF12X works in total transparent method where the Capacitor Bank control is in hands of MODBUS master.

3 Two System connected by Bus-Coupler : Reactive Power sharing



Two PF correction systems used from two different feeders can work like an independent two systems. These two systems are interconnected by usage of Bus-Coupler (BC) for redundancy purpose. In such scenario, when Bus-Coupler is ON with one of the two Breakers (either B1 or B2) are off, both the loads are operated by one transformer.

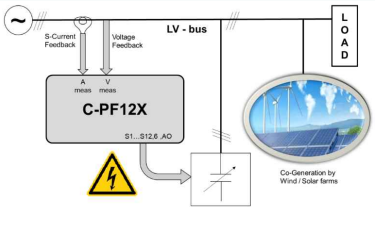
Such systems are commonly used for ensuring the redundancy of the supply system.

Usage of 2nos. of summation CTs with primary, secondary & tertiary ratio as 1:1:1. These would be wired similarly as shown in the diagram with the correct dot polarity of the CT terminals.

No special settings are needed (C-PF12X configuration) with this scheme. EASY EDIT / EXPERT EDIT can be used for the scheme.

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4 Scheme with Co-Generation like Solar and Wind Power



C-PF12X always works in 4-Quadrant power measurement. Therefore, with Co-Generation schemes, it works without any special settings.

One care is critical during such operations is: Not to enable the Zero current and Under Load faults with capacitor tripping action. This may cause the PF controller to trip off capacitor banks when the supply system experiences near zero Active Power loading. Thus, to avoid such un-necessary tripping during near zero Active Power, these faults should be ensured to be in disabled or LDATA configurations.

APPLICATIONS

Applications Category

Digital Communication

APPLICABLE MODELS

C-PF12X-12K1NMNO

C-PF12X-06K1NMNO

RS-485 OPERATION SELECTION

1 — PC-App with Windows based program – PFC_CIVAUX

2 — MODBUS – RTU or MODBUS – ASCII

There is 1 serial digital communication port — RS-485 (COM-2) on the applicable models.

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1 RS-485 – PC-App with Windows based program : PFC_CIVAUX



The usage of connectivity from C-PF12X to PC based "PFC_CIVAUX_V*" program is as on RS-485 communication:

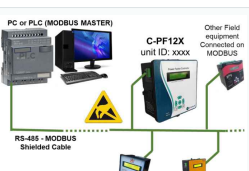
- Viewing the instantaneous values of various measured parameters. A Real-Time data refreshed every 1 second.
- Real-Time data is with COM 2 (RS-485) settings as either MODBUS-ASC or MODBUS-RTU.
- Downloading & Uploading (with changes) to C-PF12X User settings / configurations.

Note that the user interface Desktop / Laptop / Tab unit should be equipped with RS-485 port. If the user interface does not have RS-485 port, one can use the externally connected USB to RS-485 converter.

While communicating, between the C-PF12X and user interface, ensure the correct settings for baud rate and parity bit.

APPLICATIONS

2 RS-485 – Modbus – RTU or Modbus – ASCII



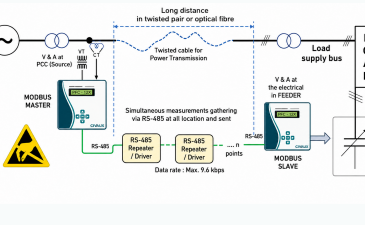
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The unit C-PF12X can be connected to standard MODBUS port controlled by MASTER for point to multi-point communication. Specific unit ID (4-digit numeric) is unique for the specified unit is to be programmed in C-PF12X.

The MODBUS Address table is a part of Annexure to this Operations Manual. MODBUS programmers are advised to refer the Annexure for programming.

APPLICATIONS

3 RS-485 – MODBUS Master measurement : MODBUS Slave capacitor control



C-PF12X can be used as a remote meter in RS-485 MODBUS MASTER configuration. The other C-PF12X unit is configured in MODBUS SLAVE configuration, and it is setup in REM1 (Remote 1) configuration.

The data measured on MODBUS MASTER is digitally transferred to the MODBUS SLAVE unit. The MODBUS SLAVE unit in REM1 remote mode would accept this data as measured data and would compensate with the capacitor switching. The MODBUS SLAVE unit would not be carrying out the local measurement of Voltage and Current.

If the RS-485 shielded cable length is higher than 500 meters, the RS-485 repeater/buffer units should be used for ensuring the data transfer with reliability.

C-PF12X MODBUS MASTER settings and C-PF12X MODBUS SLAVE settings should be carried out as per the details in the further part of this Operations Manual.

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USER INTERFACE

User Interface

LED Indication | **Keyboard** | **LCD Display**

LED Indication



LEDs on the front are two numbers. **GREEN** colour indicates C-PF12X health, The **RED** colour indicates the fault status.

Health indicator — GREEN LED

SLOW BLINK	Good health status
OFF	Unit hardware fault
ON	Unit hardware fault
FAST BLINK	Unit hardware fault
ABRUPT / INTERMI	Unit hardware fault

Fault indicator — RED LED

OFF	No fault
SLOW BLINK	Fault/s detected on supply system
ON	Fault/s detected on capacitor step/s

Keyboard

Seven (7) Keys
Soft touch with operational feel



NAVIGATION KEYS
- UP KEY
- DOWN KEY
- LEFT KEY
- RIGHT KEY
- ENTER KEY

CONTROL KEYS
- MODE KEY
- SAVE KEY (MEMORIZE)

Group	Keys
Control	Enter (confirm value / action), Mode (mode & parameter selection), Save (memorize)

The Keyboard is 7 keys and functionalities are "USER FRIENDLY".

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LCD Display

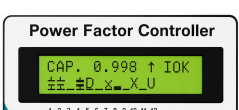


FIG 15. 3 16-character × 2-line backlit LCD with capacitor-bank step numbering 1–12.

- View the various measured, controlled, calculated and abnormal parameters as desired by the user.
- Edit the "user settings" of modes, parameters, reset-value programs, etc.
- Viewing & editing functionality is associated with keyboard actions by the user.
- The numbering 1, 2, 3 ... 11, 12 below the LCD is the capacitor-bank step number shown on the default screen.

Checks Before Powering Up

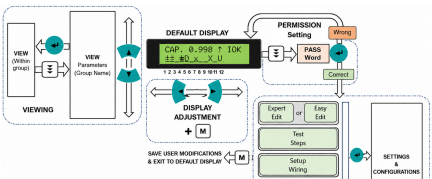
1. Inspect the C-PF12X for any physical damage and for tamper-proof seals in a torn state. In case of any of these issues, the unit should not be used and should be replaced.
2. Check that the C-PF12X is securely mounted on the PF-correction system panel door with all 4 clamps, per the earlier instructions.
3. Ensure the wiring is as per the required scheme: 1.5 mm² Cu, 1.1 kV insulation wires for all voltage and switching-step terminals; 2.5 mm² Cu, 1.1 kV insulation wires for current (CT) terminals.
4. Check that the supply current S-CT is kept in shorting condition (CT shorting external to the C-PF12X).
5. Ensure the correct fork-type lugs (provided with the unit) are properly crimped to wires. Tighten terminal screws to maximum 0.5 N·m torque.

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6. Check that supply-current S-CT terminals are tightened. Loose connections can cause permanent damage to PF-correction-system components, including burning of the C-PF12X terminals.
7. Ensure the correct-capacity RC snubber circuits are used across the actuator (inductive coil) of the capacitor-switching-duty contactor. For HV capacitor switching, ensure RC snubbers for the intermediate buffering-relay actuator coils too.

16 LCD Display & Keyboard Function

Overall Navigation Philosophy



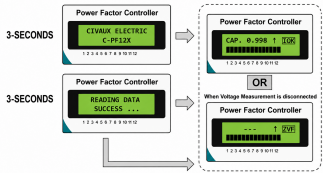
The Display section is divided into three categories:
1. VIEWING Section: Viewing of various parameters and sub-parameters.
2. Display Adjustment Section.
3. MODE selection & Settings / Configuration. Permission is through password option : factory default is '0000' & is kept disabled. Thus, first time usage, the permission is not asked.
Details of password setting is in further section of this manual.

Navigation philosophy diagram

FIG 16.1 Overall navigation philosophy — viewing, display adjustment, and mode selection & settings.

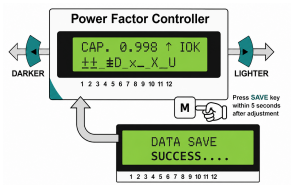
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Default Display



At power-up, the capacitor steps are always in the "discharge" state.

ADJUSTING LCD VIEWING ANGLE / CONTRAST



Contrast adjustment flow

FIG 16. 3 Contrast adjustment — LEFT key darker, RIGHT key lighter; press SAVE within 5 seconds to store.

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Contrast / viewing-angle adjustment is on the default display using the LEFT or RIGHT navigation keys. Multiple strokes of RIGHT make the display lighter; multiple strokes of LEFT make it darker. After adjustment, pressing SAVE within 5 seconds permanently stores the contrast setting. If SAVE is not pressed, the adjusted contrast is active only until the auxiliary supply is powered down. Note that SAVE is normally inactive on the default display.

DEFAULT DISPLAY EXPLANATION



Default display

FIG 16.4 Typical default display — 16 characters × 2 line

The top line gives electrical-supply system information; the bottom line shows capacitor-bank status.

FIG 16.5

CAP.	0.998	↑	IOK

The 3 characters indicates the status of the operational unit. IOK : I am OK. The other indication is to indicate as FAULT.

The 3 characters have 1st & 3rd character as blank. The 2nd character is either upward arrow ↑ informing general operation or shows the downward arrow ↓ informing special operation.

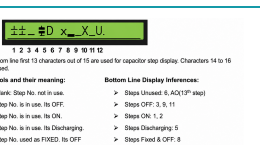
The 6 characters informs the supply system PF. The Power Factor is D.PF. (displacement PF) The ↑ character is either blank or is with – sign. The bank indicates the supply system is consuming active power and the – sign indicates the supply system is generating active power.

The 4 characters are either "IND." or "CAP."
IND. : informs D-PF is inductive.
CAP. : informs D-PF is capacitive.

Top-line fields.

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FIG 16.6



Bottom-line step symbols & meanings.

17 Viewing Parameter Values

From the default display, the MODE key steps through the primary viewing sections; the navigation keys move within each section. The sections are: Overall Values, Energy & Max. Demand, Step VAR (normalized), Harmonics, Maximum Values, Step Utilization, Aux. Function and Product Details.

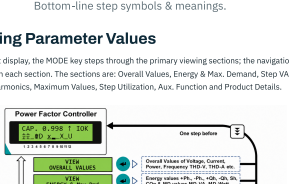


FIG 17.1 Viewing primary sections and their contents.

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Overall Values

Voltage, current, active / reactive / apparent power (RMS and fundamental), distortion power, V-THD & A-THD, uncompensated Q1 to target PF, frequency, and PF / DPF (inductive or capacitive).

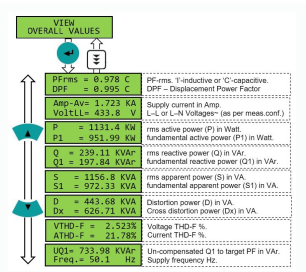


FIG 17. 2 View: Overall Values.

Energy & Maximum Demand

Active / reactive / apparent energy (import & export, RMS & fundamental), capacitive and distortion energy, and recorded maximum demand (kVA & kW). Generator-energy values are shown when the EB/GEN configuration is selected in the Auxiliary I/O section.

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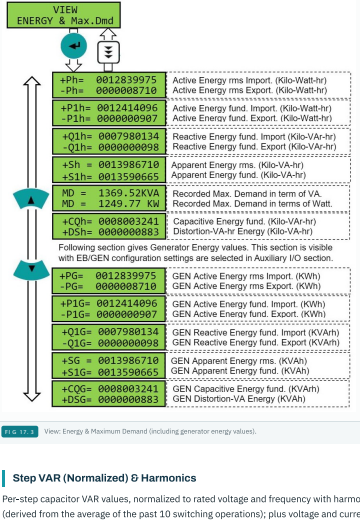


FIG 17.3 View: Energy & Maximum Demand (including generator energy values).

Step VAR (Normalized) & Harmonics

Per-step capacitor VAR values, normalized to rated voltage and frequency with harmonics removed (derived from the average of the past 10 switching operations); plus voltage and current harmonics up to the 31st harmonic (THD% and THD / TDD values).

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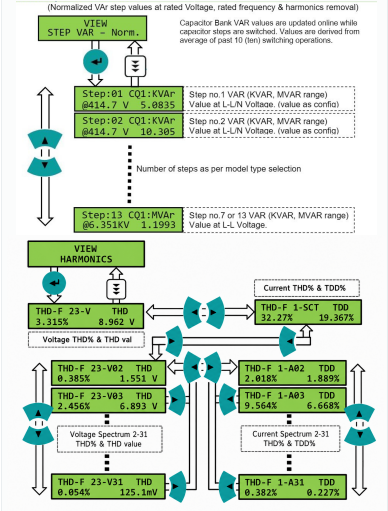


FIG 17.4 View: Step VAR — Normalized, and View: Harmonics.

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Maximum Values

Maximum recorded values for line-to-neutral / line-to-line voltage, current, active / reactive / apparent power, THD on voltage, and TDD on current — according to measurement configuration 3 or 4.

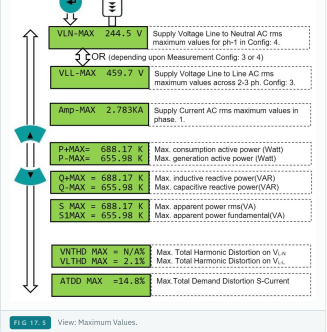
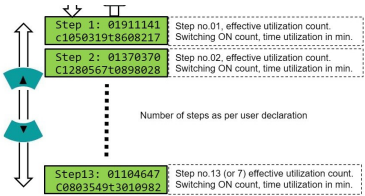


FIG 17.5 View: Maximum Values.

Step Utilization

Per-step utilization count, combining switch-ON count and ON-time, computed as `COUNTS = (switching-ON counts / C) + (ON-time minutes / T)`, where C and T are set in Expert Edit — Cap Control.

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COUNTS = (switching ON counts / **C**) + (ON time in minutes / **T**)
Whenever the value of C or T

For Example:

c0803549 – switching ON count.
&
t3010982 time utilization in min.

If Value of C = 01 and Value of T = 10 (Setting adjusted in EXPERT EDIT – CAP CONTROL)

COUNT = (803549 / 1) + (3010982 / 10) = **1104647**

FIG 17. 6 View: Step Utilization.

Aux. Function & Product Details

Internal temperature and auxiliary-input status (digital value and AC-volt value); plus COM 2 unit ID, model number, product serial number and product version. (The Aux. Function screen cannot be viewed if MODE: EASY EDIT is enabled.)

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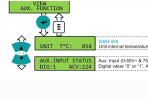


FIG 17.7 View: Aux. Function.

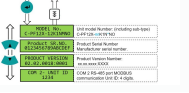


FIG 17.8 View: Product Details.

18 Configuring C-PF12X through Settings

Configuration is carried out by the operator using the keyboard and LCD display. The C-PF12X is an integral part of an Automatic Power Factor Correction / Reactive Power Compensation system; such systems have different ratings and requirements, so the C-PF12X must be configured to suit the application. A wrongly-configured unit will not give optimal performance.

Before configuring, acquire the relevant information about the PF-correction / reactive-power system and the electrical supply source on which it is fitted, and program that information into the C-PF12X.

Entering the Configuration Section — Mode Select

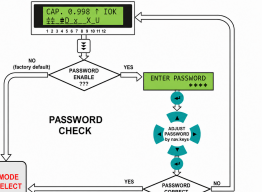
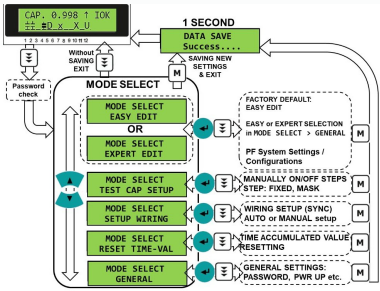


FIG 18.1 Entering Mode Select — password check (factory default 0000, disabled).

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Mode Select — Environment



For simple LV application requirements, users are advised to use "**EASY EDIT**" setting configuration.

FIG 18. 2 Mode Select environment — Easy / Expert Edit, Test Cap Setup, Setup Wiring, Reset Time-Val and General.

For simple LV applications, use the **Easy Edit** configuration — it sets the C-PF12X with just a few parameters and even offers an auto-setup option. Easy Edit is recommended for:

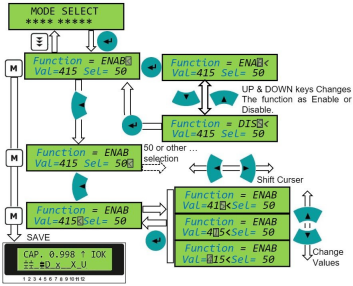
- LV standard capacitor-switched PF correction through contactor-switched capacitors.
- Three-phase balanced capacitor steps.
- Quadrature measurement-feedback configuration (measurement configuration no. 3).
- Protection faults normally disabled; contactor-coil voltage monitoring fault & trip auto-activated on the Aux. Input.
- Aux. Output with the fixed functionality of an additional step as capacitor bank no. 07 or 13.

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For special functionality and HV applications, the **Expert Edit** settings are mandatory, and users must become well acquainted with the various parameter settings.

No keyboard activity for 3 minutes activates a timeout to the default screen (without saving).

Parameter-Editing Philosophy



The above flowchart of philosophy of parameter editing once understood, the navigation around the parameter settings is convenient.

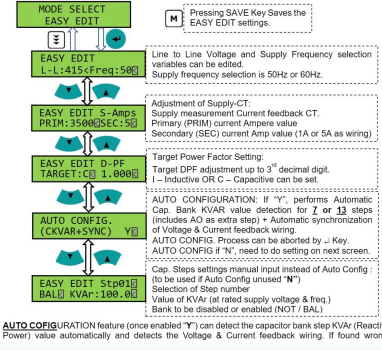
Users are advised to get used to the above keyboard / display function flow-chart.

FIG 18. 3 General parameter-editing flow — ENTER selects, MODE returns without saving, SAVE stores.

Pressing ENTER on any mode selects its function and parameter screen. Pressing MODE returns to the original Mode-Select screen without saving. Pressing SAVE stores all values of that function. The UP / DOWN keys change a function (enable / disable) or value; the LEFT / RIGHT keys shift the cursor.

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Mode Select — Easy Edit



AUTO COFIGURATION feature (once enabled "**Y**") can detect the capacitor bank step KVAr (Reactive Power) value automatically and detects the Voltage & Current feedback wiring. If found wrong,

FIG 18.4 Easy Edit flow — rated L-L voltage & frequency, supply CT, target D-PF, auto-configuration and manual step kVAr.

The **Auto-Configuration** feature (when enabled "Y") detects the capacitor-bank step kVAr value automatically and detects the voltage & current feedback wiring — correcting it automatically if found wrong. In the presence of highly-fluctuating loads it may fail to detect the right kVAr value or correct the wiring sequence; in such cases the user must enter the step kVAr value manually and deploy wiring settings manually (see Setup Wiring — Manual Sync).

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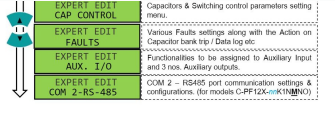
DEFINING THE CAPACITOR STEP KVAR VALUE

The capacitor step value is defined in kVar at the rated supply voltage (the L-L value set in the first Easy Edit screen). The kVAr value may not equal the capacitor nameplate kVAr, as that may be defined at a different voltage. When the capacitor bank is used with anti-resonant detuned reactors, the value must be calculated taking the inductor effect into account:

WORKED EXAMPLE

Capacitor nameplate = 50 kVAr (cQ) at 525 Vac LL (cV); rated supply V_{LL} = 415 Vac LL (Vr), 50 Hz; detuned-reactor resonance frequency (fr) = 187 Hz.
Effective step kVAr = (Vr/cV)² × [cQ / (1 – (f/fr)²)] =
33.648 KVAR @ 415 VAC LL
. Enter this calculated value manually.

Mode Select — Expert Edit



The above representation shows that there are multiple sections for selection of the "User Set" parameters.

These sections are for:

1. Measurement settings.
2. Capacitor Control settings.
3. Fault limits and action settings.
4. Auxiliary Input and Auxiliary Outputs settings.
5. RS-485 (Comm-2) serial communication port settings. (for models C-PF12X-mK1NMNO)

Settings in the **EXPERT EDIT** sections are available to the users only when MODE SELECT : GENERAL : OPERATING MODE : EXPERT is selected. (Default factory setting is **EASY EDIT**)

Expert Edit settings are advised to be carried out by trained personnel. It would be good to go through the entire settings section of this Operations Manual and understand the impact of each setting, on the operation of C-PF12X.

Any wrong setting can adversely hamper the performance of the Power Factor correction system. Contact our offices for any technical support on settings.

FIG 18.5 Expert Edit sections — Measurement, Cap Control, Faults, Aux. I/O and COM 2 (RS-485).

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Expert Edit provides sections for: (1) Measurement settings, (2) Capacitor-control settings, (3) Fault limits & action settings, (4) Auxiliary Input / Output settings, and (5) RS-485 (COM-2) serial-communication settings (models C-PF12X-nnK1NMNO). These are available only when Mode Select → General → Operating Mode → EXPERT is selected (factory default is Easy Edit).

TRAINED PERSONNEL

Expert Edit should be carried out by trained personnel. Any wrong setting can adversely affect PF-correction performance. Contact CIVAUX offices for technical support on settings.

Expert Edit — Measurement

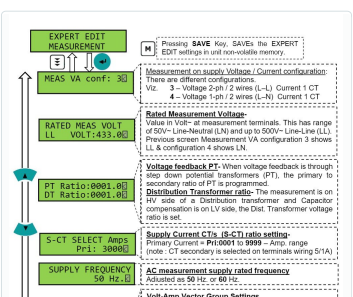


FIG 18. 6 Measurement settings — VA configuration, rated voltage, PT & DT ratios, S-CT ratio, supply frequency and V-A vector group.

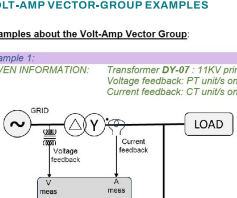
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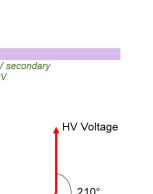
- **MEAS VA config:** 3 = Voltage 2-ph / 2-wire (L-L), Current 1 CT; 4 = Voltage 1-ph / 2-wire (L-N), Current 1 CT
- **Rated measurement voltage:** value at the measurement terminals, 50 V– (L-N) to 500 V– (L-L).
- **PT ratio:** primary-to-secondary ratio when voltage feedback is via step-down potential transformers.
- **DT ratio:** distribution-transformer voltage ratio when measurement is on the HV side and compensation on the LV side.
- **S-CT select:** primary current 0001–9999 A (secondary 5A / 1A selected on the terminal wiring).
- **Supply frequency:** 50 Hz or 60 Hz.
- **V-A vector group:** measurement positions of PT (Volt) and CT (Current) — L(V)H(A) or H(V)L(A) — and the V-I vector position in 30° steps (000°:00 ... 330°:11).

VOLT-AMP VECTOR-GROUP EXAMPLES

Examples about the Volt-Amp Vector Group:

Example 1:
GIVEN INFORMATION: *Transformer **DY-07** : 11KV primary / 660V secondary*
Voltage feedback: PT unit/s on 11KV:110V
Current feedback: CT unit/s on 660V

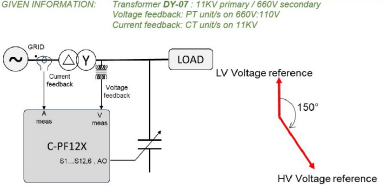




Settings on **C-PF12X** PFC unit:
RATED MEAS VOLT > LL VOLT >> **110.0** (PT secondary as rated measurement voltage)
PT Ratio >> **0100.0** (PT is 11KV/0.11KV = 100.0)
DT Ratio >> **0016.7** (DT is 11KV/0.66KV = 16.7)
VA-VECTOR GROUP >> **H(V)L(A) >> 210°** (Refer the phasor diagram on RH side)

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Example 2:
GIVEN INFORMATION: *Transformer* ***DY-07*** *, 11KV primary / 660V secondary*
Voltage feedback: PT unit/s on 660V/110V
Current feedback: CT unit/s on 11KV



Settings on **C-PF12X** PFC unit:
RATED MEAS VOLT > LL VOLT >> **110.0** (PT secondary as rated measurement voltage)
PT Ratio >> **0006.0** (PT is 660V/110V = 6.0)
DT Ratio >> **0016.7** (DT is 11KV/0.66KV = 16.7)
VA-VECTOR GROUP >> **L(V)H(A)** >> **150°** (Refer the phasor diagram on RH side)

FIG 18.7 Phasor relationships for the vector-group examples.

Mode Select: Expert Edit: Measurement .....continued.....



Settings for LV voltage & LV current feedback with PF mitigation on HV side of the transformer.

As per scheme given in APPLICATIONS CATEGORY: (Volt-Amp feedback & Capacitor Bank Position) subtopic no.6: LV Current – LV Voltage AND HV mitigation — LV Capacitor switching

Totally, 3 parameters from the HV to LV transformers are set.

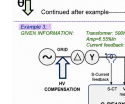
1. Transformer VA Rating (i.e. kVA)
2. Transformer Transfer impedance %Z (i.e. % value)
3. Transformer No Load current (i.e. % of rated current)

As a default, the transformer VA rating value is declared as zero '0000' kVA. **With zero value, this feature is disabled.** Any other transformer VA rating '0001' to '9999' kVA value set would enable this feature. Transformer right VA rating **i.e. kVA** can be seen from transformer name plate.

Transformer **transfer impedance value %Z** can be set between 01.00% to 25.00%. These values can be seen from the transformer rating plate.

Transformer **No Load current** value can be set from 01.00% to 15.00% of its rated current % ratio. This value is normally acquired from the Transformer manufacturer's test report.

Example 3:
GIVEN INFORMATION: Transformer: 500KVA : 11KV / 400V. %Z=5.14%, NL Amps=6.125Ah Voltage feedback :Direct 400V
Current feedback: CT units on LV side



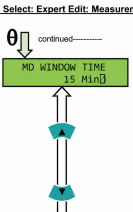
Settings on C-PF12X PFC unit:

RATED MEAS VOLT > LL VOLT >>	**400.0**	(DT secondary rated measurement voltage)
PT Ratio >>	**0001.0**	
DT Ratio >>	**0027.5**	(DT is 11KV/400V = 27.5)
Tr^mer VA Rating >>	**0500.**	
Tr^mer VAr Comp. > %Z >>	**05.14%**	
Tr^mer VAr Comp. > NoLoad A: >>	**06.59%**	

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Given	Rated V (LL)	PT ratio	DT ratio	V-A vector group
Ex 1 — DY-07 11kV/660V; PT 11kV:110V; CT on 660V	110. 0	100. 0	16. 7	H(V) L(A) 210°
Ex 2 — DY-07 11kV/660V; PT 660V:110V; CT on 11kV	110. 0	6. 0	16. 7	L(V) H(A) 150°
Ex 3 — 500kVA 11kV/400V, %Z 5.14%, NL 6.55%; direct 400V; CT on LV	400. 0	1. 0	27. 5	—

Mode Select: Expert Edit: Measurement ….continued…..



Maximum Demand Window time-
This function is for user observation and alarm annunciation.
Maximum Demand (MD) is measured in terms of Active Power (Kilo-Watt) and Apparent Power (Kilo-VA).
The MD measurement window size is determined by user. Normally user selects it on Electricity Supply / Distribution Company's standards. C-PF12Xmeasures the MD with 1min. Sliding window time basis. Min 05 min. to Max 60 min.

Aux. Input ac voltage measurement, the Calibration is to be carried out. It's for the Auxiliary input AC measurement functionality **CONT-V**. There is no need to carry out calibration process, and screen would not be available for digital function.

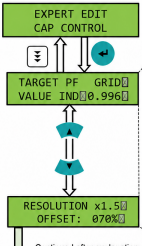
Auxiliary input is factory calibrated for sinusoidal AC voltage input. The Operating conditions at site may be differ. Calibration is needed under such conditions. For a given site, it is normally carried out just once while commissioning.

Procedure for Calibration:
Instrument needed: AC voltage measurement meter (RMS). 0 to 300Vac; Accuracy 1%.
Apply AC voltage that is site available for Auxiliary Input channel.
Check the AC voltage with a measurement meter.
Check the AC voltage displayed on the C-PF12Xscreen.
Adjust the Offset count suitably to match the screen displayed reading = meter display.
Ensure SAVE Key is pressed after readings are matched.

This screen observable if AVL fault Enabled & AI is set to V-cont.

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Mode Select: Expert Edit: Cap Control



Details on Power Factor settings + Resolution + Offset is explained in Application Notes.

TARGET D-PF: The desired Power Factor is set. It is normally set for **GRID** supply & can be set for **GENR** (Generator) for Aux. Input functionality is selected for GRID / GENERATOR. The target-PF value is user set as **IND** (inductive) or **CAP** (capacitive). The Target-PF Value can be set up to 3 digits after decimal.

RESOLUTION MULTIPLIER: The value of multiplier can be set from **1.1** to **9.9**.

OFFSET: The No action Band "Offset" can be adjusted from **000%** to **100%**. Default value is **050%**.

Target PF settings + refinements in PF values

There are multiple settings provided in C-PF12X.

- ✓ Target Power Factor (D-PF) Value.
- ✓ Target Power Factor selection for "Inductive" or "Capacitive"
- ✓ Smallest capacitor bank reactive power multiplying factor.
- ✓ Offset value to No action band around Target Power Factor.

Grid supply **"GRID"** and Generator supply **"GENR"** operation dual PF functionality is Enabled / Disabled through Auxiliary input (AI) settings (details in later part of the operations manual).
In case the setting is enabled, the **GRID** supply Target PF and **GENR** supply Target PF setting are to be set by the user.
In case the setting is disabled, the **GENR** setting would not be displayed.

The settings to be carried out are:

- ✓ Target Power Factor (D-PF) Value.
- ✓ Target Power Factor selection for "Inductive" **IND** or "Capacitive" **CAP**.

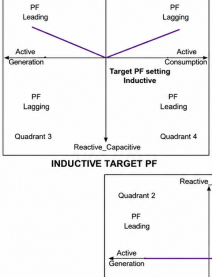
These are set with different values for Grid supply and different for Generator supply operation.

The other two important settings that are common for GRID & GENR are:

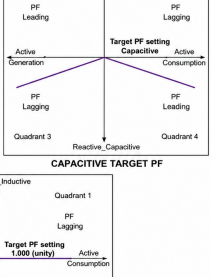
- ✓ Smallest capacitor bank reactive power multiplying factor.
- ✓ Offset value to No action band around Target Power Factor.

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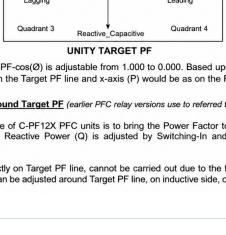
Following are the Various positions of Target PF settings for Inductive, Capacitive and Unity settings.



INDUCTIVE TARGET PF



CAPACITIVE TARGET PF



UNITY TARGET PF

The Value of Target PF-cos(Ø) is adjustable from 1.000 to 0.000. Based upon the cos(Ø) value, the angle Ø between the Target PF line and x-axis (P) would be as on the Power diagram.

No Action Band around Target PF *(earlier PFC relay versions use to referred to as C/K ratio):*

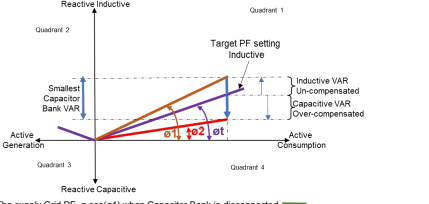
The primary objective of C-PF12X PFC units is to bring the Power Factor to the exact point on Target PF line. The Reactive Power (Q) is adjusted by Switching-In and Switching-Out the Capacitors.

Bringing the PF exactly on Target PF line, cannot be carried out due to the finite Capacitor step size. Either the PF can be adjusted around Target PF line, on inductive side, or on capacitive side.

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For an example:
If the smallest adjustable capacitor bank is 5 KVARand, the requirement to Target PF line is just 3 KVAR from the inductive side.
Then, the minimum uncompensated Q value (reactive power value), is either by switching-in 5 KVAR bank to get 2KVAR uncompensated capacitive Q value; or keeping 5 KVAR off to get 3KVAR uncompensated inductive Q.

This can be explained by the following diagram.



The supply Grid $PF_1 = \cos(\text{ø}1)$ when Capacitor Bank is disconnected
The supply Grid $PF_2 = \cos(\text{ø}2)$ when Capacitor Bank is connected
The user desired $PF_t = \cos(\text{øt})$ that is "Target Power Factor"

The smallest capacitor bank is inserted; the Power Factor is over-compensated. i.e., on the capacitive side of Target PF.
And when the Smallest Capacitor bank is disconnected, the Power Factor is under-compensated. i.e. on the inductive side of Target PF.

From the above explanation and example, it's obvious that desired Target Power Factor can be either Over-compensated or Under-compensated. The amount of Over or Under Compensation depends upon the Smallest Capacitor bank Reactive Power VAR value.

Due to this phenomenon, the smallest capacitor would be switched On and switched Off on regular basis. (Depending upon the correction time cycle). Such continuous ON or OFF is an "Undesirable Phenomenon". The reasons are:

- Reduction of Capacitor Life.
- Reduction of the Switching Contactor Life.
- Regular switching transients on the supply system.
- Regular maintenance of the PF correction system.

To prevent such undesirable phenomena, C-PF12X PFC creates a "NO Action VAR area" around the Target PF. Referred as **No Action Band**.

Additionally, one can realize that smaller the size of smallest capacitor step, the deviation from Target PF is minimum.

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NO-ACTION BAND

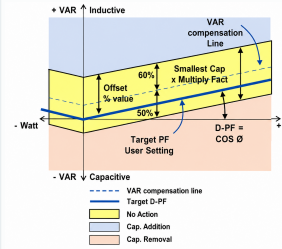


FIG 18. 13 No-action band — width set by the smallest-bank multiplier, position set by the offset.

SmallestcapacitorbankVAR× multiplying factor = No-Action Band VAR value. The band must be broader than or equal to the smallest bank's VAR (to allow for VAR rise due to over-voltage / over-frequency), hence the multiplier range >1.1.

The offset (default 50%) places the band equally on both sides of the target PF; increasing it shifts the band to the inductive side, decreasing it to the capacitive side, per site and billing requirements.

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CORRECTION, DISCHARGE & INTERLEAVE TIMING

Continued --------

CORRECTION TIME
FIX.[] SEC:0010[]

DISCHARGE TIME
SEC:0120[]

INTERLEAVE TIME
SEC:01.5[]

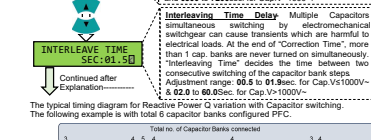
Continued after Explanation----------

Correction Cycle Time-
Correction cycle time can be Either **FIX.** or **PRO.** (Fixed or proportionate). **C-PF12X** model, time is adjusted in Seconds from **0002** to **0119** for Cap.Vs1000V~ & **0120** to **3600** for Cap.V>1000V~. Note: Cap.V from DT ratio.
Fixed: The correction time is constant as directly set.
Proportionate: The correction time is variable. It is inversely proportional to Uncompensated VAR (Q) value.
Correction Time (seconds) =
[(Smallest Bank VAR X set time X 10) / Uncomp. VAR]
The proportionate setting helps to reduce correction time when Q requirement is high & viceversa.

Capacitor Discharge Time for safe turn-on:
The Capacitor bank after switching off needs to be discharged before it is switched on. The discharge time is set on **C-PF12X**. The timing can be set for capacitor discharge from **0001** to **0299**sec. for Cap.Vs1000V~ and **0300** to **7200**sec. for Cap.V>1000V~.

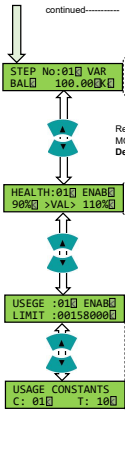
Interleaving Time Delay- Multiple Capacitors simultaneous switching by electromechanical switchgear can cause transients which are harmful to electrical loads. At the end of "Correction Time", more than 1 cap. banks are never turned on simultaneously. "Interleaving Time" decides the time between two consecutive switching of the capacitor bank steps
Adjustment range: **00.5** to **01.9**sec. for Cap.Vs1000V~ & **02.0** to **60.0**Sec. for Cap.V>1000V~.

The typical timing diagram for Reactive Power Q variation with Capacitor switching.
The following example is with total 6 capacitor banks configured PFC.



From the above timing diagram one can see the Correction, Discharge & Interleaving time functionality. The bottom-most timeline shows the dynamic variation that can be observed in "Q" Reactive Power. The no action reactive power band is shown. (Refer App. Note.3 for details on No Action Band)

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Capacitor Bank details-
Step No: 01 to 07/13 to be selected for setting values.
Capacitor **VAR units** in **K**VAR or **M**VAR can be set.
Capacitor **Step**: Options:

- **NOT : Step is not used**
- **BAL : Balanced three phases.**

Indication for VAR as **K: K**VAR **/ M:** MVAR at rated voltage of the supply bus. Number range adjustable **000.10–999.99**

Refer the capacitor Q value calculation from the previous section
MODE SELECT > EASY EDIT
Defining the capacitor step KVAR value (Page no.51)

Capacitor Health Monitoring-
For each capacitor step **health monitoring**.
User set : **Lower limit:** 50-99%, **Upper limit:** 101-150%.
Step No.**01-07/13** to be individually selected.
Set health monitoring **ENAB / DISS** (Enable / Disable).
Tolerance above & below can be set.

Capacitor Usage Limit:
Each capacitor step is monitored for its usage. Usage is in terms of "ON-OFF operations" number (Counts) and the "ON-time in minutes". Total usage count is calculated as:
Usage Count = [Switch ON count / C] + [time (Min) / T]
(This is effective empirical formula)
Standard values with C=01 & T=10, the normal limits are:
MPP Normal Duty: 00158000
MPP Heavy Duty: 00320000
APP: 00650000
MD (Super heavy duty): 02000000.
USAGE CONSTANTS:
In the above Usage Count formula, the Constants C and T are user set value depending upon the type of capacitors, site conditions of Voltage fluctuations, Harmonics etc.
As per the manufacturer of capacitor – these constants may change. Giving these editable constants is to keep flexibility of adjustments.
When **C is set to zero**, the on / off consideration is removed & when **T is set to zero**, the time consideration is removed.

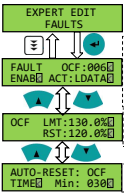
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Mode Select: Expert Edit: Faults

The table of the various faults detected along with the Max/Min Limit & Reset values:

Fault No.	Fault Code	Faults Description	Limit / Reset
001	**UVF**	Under Voltage fault.	LMT: 50% - 98% RST: 51% - 99%
002	**OVF**	Over Voltage fault.	LMT: 102% - 125% RST: 101% - 124%
003	**ZVF**	Zero Voltage detected.	LMT: 1% - 49% RST: 2% - 50%
004	**SUF**	Under Frequency on supply.	LMT: 47.0Hz – 49.6Hz (50Hz) 57.0Hz – 59.6Hz (60Hz) RST: 47.2Hz – 49.8Hz (50Hz) 57.2Hz – 59.8Hz (60Hz)
005	**SOF**	Over Frequency on supply.	LMT: 50.4Hz – 53.0Hz (50Hz) 50.2Hz – 52.8Hz (60Hz) RST: 60.4Hz – 63.0Hz (50Hz) 60.2Hz – 62.8Hz (60Hz)
006	**OCF**	Measurement Over Current.	LMT: 101.5% - 145.0% RST: 101.0% - 144.5%
007	**ZCF**	Zero current detected.	LMT: 000.5% - 019.5% RST: 001.0% - 020.0%
008	**VHF**	Voltage Over harmonics.	LMT: 001.5% - 020.0% RST: 001.0% - 019.5% For **LIMI** (limit) options as here. For **ENT** (enter) option to restart For **TIME** (time) with **Min:** 000-999 time the unit would autoreset
009	**CHF**	Current Over harmonics.	LMT: 002.5% - 080.0% RST: 002.0% - 079.5% For **LIMI** (limit) options as here. For **ENT** (enter) option to restart For **TIME** (time) with **Min:** 000-999 time the unit would autoresume
010	**ULF**	Under Load i.t.o. Active Power(P).	LMT: 000.2% - 050.5% RST: 000.7% - 051.0%
011	**MOT**	Temperature exceeding the limit.	LMT: 034.5°C - 075.0°C RST: 034.0°C - 074.5°C
012	**OBF**	Out of bank fault(capacitors less) Detection in Correction cycles	LMT: 1CC – 9CC (correction cycle) RST: 1CC – 9CC
013	**PFL**	Leading Power Factor. Detection in Correction cycles	LMT: 1CC – 9CC (correction cycle) RST: 1CC – 9CC
014	**MDW**	Maximum Demand KW exceeding.	LMT: 010.5% - 135.0% RST: 010.0% - 134.5%
015	**MDV**	Maximum Demand KVA exceeding.	LMT: 010.5% - 135.0% RST: 010.0% - 134.5%
016	**AVL**	Auxiliary I/P AC Voltage is Low.	LMT: 090.0V~ - 259.5V~ RST: 090.5V~ - 260.0V~
017	**AVH**	Auxiliary I/P AC Voltage is High.	LMT: 110.5V~ - 300.0V~ RST: 110.0V~ - 299.5V~

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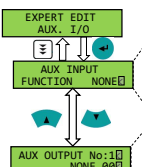


Screen selects **Fault Number**, Selected Fault is Enabled **ENAB** or Disabled **DISS** and if selected, the Action **ACT** on fault detection can be selected for:
ACT:**LDATA** – Indicative fault without capacitor trip.
ACT:**NTRIP** – Trip Capacitor steps one by one.
ACT:**INS-X** – Trip all capacitor banks instantly.

This screen is accessed immediately after a specified Fault no. is Enabled. Set the Fault value Limit **LMT** and Resume **RST** value.

If the fault resume is to by User pressing **ENT** Key or after a specific **TIME**, in **Min:** (minutes) for auto reset. **Fault 8 & 9**

Mode Select: Expert Edit: Auxiliary Input / Outputs



Auxiliary Input- C-PF12X has one Aux. input channel. It is used with AC Sinusoidal Voltage ranging from 0V~ to 300V~. It can be assigned with one function. This function user can select from list available. Total 4 different functions are available. Details of all these functions is in subsequent part of this document.

Auxiliary Output- C-PF12X - has one Aux. output.

Aux. O/P has potential free Relay – Normally Open (NO) contacts.

Various functionalities that are available can be assigned to each of the Aux. Output channel.

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Auxiliary I/P:	**AI**		
Sr. No.	**Function**	**Function Details**	**Additional Remarks**
0	**NONE**	Auxiliary Input is Disabled.	No influence on PF controller actions
1	**CONT-V**	Measures input AC Voltage value (within 68V~ to 290V~)	To monitor the control supply AC voltage. For Over (AVH) and Under (AVL) voltage tripping commands.
2	**EN/DS**	0V~ - 3V~ = Logic 0 = EN 68V~ - 290V~ = Logic 1 = DS	In disabled PF correction action, all the Steps are kept off.
3	**EB/GEN**	Logic 0 : EB Supply. Logic 1 : Generator Supply	Generator ON info is given via Supply Changeover switch.
4	**HOLD**	Logic 0 : No Action. Logic 1 : Hold - As it is status.	The correction time is extended infinitely till Logic 0 is observed on this port. (Correction Measurement is stopped)

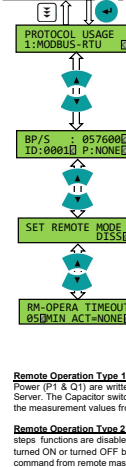
Auxiliary input is and AC input that can be used for "CONT-V" function as a AC measurement and with other functions used for digital Logic "0" or "1"
Digital Logic 0 = 0V~ to 3V~
Digital Logic 1 = 68V~ to 300V~
The logical value can be either 0 or 1 in the AC input range of 3V~ to 68V~. It should be neglected.

Auxiliary O/P:		
Fn' No.	**Function**	**Function Details**
00	**NONE**	No function assigned.
02	**ALARMI**	Annunciation indicative faults
03	**ALARMT**	Cap. trip fault Annunciation
04	**ALARMC**	1+ capacitor step/s Un-healthy
05	**ASYCFL**	Alarm for Auto-Sync failure
07	**OT-MCU**	Unit temperature over limit
11	**OK-ON**	Unit working without any fault
12	**Cap-Sp**	AO Used as extra capacitor step
13	**MD-kW**	Max. Demand. i.t.o. kW Exceed
14	**MD-kVA**	Max. Demand. i.t.o. kVA Exceed

Auxiliary Output Function Numbers are not in continued order. This is in view of the future product fault to be added.

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Mode Select: Expert Edit : RS-485 (Com2) : available only with models ***C-PF12X-nnK1NMNO***



COM 2- Usage is RS-485 serial communication port.
Communication Options
0: DISABLE – COM 2 is not used
1: MODBUS-RTU – Slave Protocol Modbus-RTU
2: MODBUS-ASC – Slave Protocol Modbus-ASCII
3: PC-Comm – Communication with PC-App software
4: **MODBUS-M-RTU** – Master Protocol Modbus-RTU
5: **MODBUS-M-ASC** – Master Protocol Modbus-ASCII

Baud Rate (User Selectable):
- **004800 BPS (4.8 kBPS)**
- **009600 BPS (9.6 kBPS)**
- **019200 BPS (19.2 kBPS)**
- **038400 BPS (38.4 kBPS)**
- **057600 BPS (57.6 kBPS)**

COM2 ID for MODBUS- Unit ID is 4 decimal digits.

Parity – P: Parity bit in communication has 3 selectable options. – Viz. **NONE**, **ODD**, **EVEN**

Remote Mode with MODBUS – COM 2:
DISS: Disable Remote mode (Normal working of C-PF12X)
REM1: Remote Operation Type 1. LCD displays "RM1"
REM2: Remote Operation Type 2. LCD displays "RM2"
Details of Remote Mode is explained here under.

Remote Mode Operation Timeout: If **REM1** (RM1) is set. This screen is visible. It gives timeout error when Remote communication is idle for the specified time. The time is in minutes & adjustable from 01 to 60 minutes.
Before Timeout period, all Configurations are disabled.
Action after Timeout:
NONE: Keeps operating in Remote.
AUTO: Exits Remote mode to Normal working.

Remote Operation Type 1 (REM1) : The supply measurement parameters like Voltage, Current, Power (P1 & Q1) are written through MODBus communication from Remote Master MOD-Bus Server. The Capacitor switching action is carried out by C-PF12X-nnK1NMNO in REM1 by using the measurement values from Remote master REM1 operation is indicated on display as "RM1".

Remote Operation Type 2 (REM2) : The supply measurement and selection of reactive power steps functions are disabled in C-PF12X-nnK1NMNO. The reactive power steps can be directly turned ON or turned OFF by the remote master. i.e. the C-PF12X-nnK1NMNO follows the command from remote master to turn ON or turn OFF the specified step number.

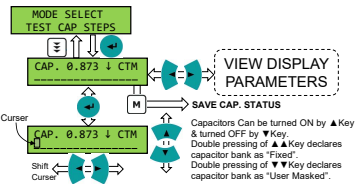
MODBUS Table data is divided into 3 parts. The MODBUS ADDRESS TABLE is in the later part of this Operations Manual. MODBUS Programmer's are advised to refer to the given table.
1. Real Time (instantaneous) Data snapshot – READ only.
2. Parameter Settings (by User) Data – READ and WRITE.
3. REM1 or REM2 – Remote Mode Data – WRITE (and READ in Real time)

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Mode Select: Test Capacitor Steps

Functionalities:

Turning ON / OFF the specified step numbers. For checking the tuning ON & turning OFF wiring, switchgear / TSC and the Capacitor Bank manually.
Declaring capacitor bank step number as "Fixed step". This can be based upon the specific installation requirements. User can declare specific step number as fixed or can bring back the "Fixed step" status to normal status.
Declaring the capacitor bank step number as "User Masked" or bringing to normal status.
Unhealthy declared capacitor bank step numbers to be brought to normal status.
Checking the PFC system performance with specific capacitor values turn ON / OFF and viewing various parameters display values on LCD.



Interface:

Pressing of Enter key causes the curser to blink on 1st available step. The curser can be shifted by ◄ Left or ► Right key to select the specific step number.
Turn on of the specific step number is by ▲ Up key and Turn off is by ▼ Down key.
"Fixed Status" to a specific step number is by double pressing of ▲ Up key. The already declared Fixed Status step number can be brought down to normal by bringing curser on that step number and then pressing the ▼ Down key.
"User Masking Status" to a specific step number is by double pressing of ▼ Down key.
Normal status to the "Unhealthy Status" or "User Masked Status" is brought by bringing the curser on that step number and then pressing the ▲ Up key.
For bringing permanent change to the status, press the Enter key so that curser stops blinking on step number line. Then press ■ Save Key.

Added Notes:

1. The arrow down symbol "↓" on LCD display is for indicating steps testing. The symbol is additionally used for indicating Remote mode or Digital Input status as 0 (zero) =↑ and 1 (one) = ↓. The digital Input functionality if enabled, the arrow symbol is prioritized for its functionality and testing mode would not be controlling the arrow display on LCD. Users are advised to take note.
2. Inactivity of more than 3minutes in "Test Capacitor Steps" MODE, would bring back the status of C-PF12X to normal automatic mode and unit would perform normally with automatic functionality.

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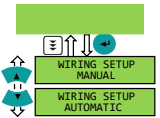
Mode Select: Setup (Measurement Feedback) Wiring

The wiring setup is for the right Voltage & Current feedback Phase sequence is connected to C-PF12Xfrom Supply system. Ensuring the Current feedback CTs (Current Transformers) are with right polarity and synchronized with the right Voltage phases.

In case the wiring sequence is wrongly connected, using the "SETUP WIRING" can correct supply Voltage & Current synchronization without physically changing the wires.

There are two methods used for setting up wiring without physically change of wiring.

1. **Manual Synchronization**
2. **Automatic Synchronization**

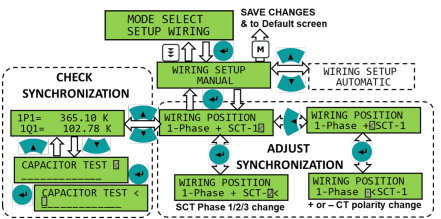


Manual Synchronization

Manual Synchronization allows user to switch ON / OFF the capacitors and check the right values of fundamental Power (Active & Reactive) by selecting the right Voltage / Current combination and the Current CT polarity.

The general guidelines are explained here the flowchart.

For Manual Wiring Setup, a good understanding of the 4 – Quadrant Power and Power Factor Correction is necessary. With this, the 100% success rate for synchronization can be achieved in Manual Synchronization.
With trained personnel, Manual Synchronization gives 100% success.



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Automatic Synchronization

Automatic Synchronization carries out the supply Voltage & Current feedback synchronization automatically. For automatically carrying out the job, it needs to turn ON and turn OFF the capacitor banks. Therefore, it is necessary to complete the User settings by EXPERT EDIT.

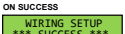


Automatic setup is by switching ON-OFF of each capacitor banks once and status is shown on the screen with Capacitor step number 01 to 07/13 blinking one after other.

In case of any faults and unit is not able to perform Automatic Sync., it shows the status PENDING instead of TRY01.

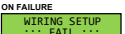
During Auto-Sync process Enter key aborts the process.

ON SUCCESS



For 3 Seconds and then continues normal operation in Default screen (with newly selected wiring positions)

ON FAILURE



For 3 Seconds and then forces user to enter the Manual Setup.

Note that on Success, the unit C-PF12X remembers the sequence throughout its life unless the Factory Default is loaded. Auxiliary Supply Powering down would not disturb this memorized sequence.

An option in EXPERT EDIT to automatically get into the "Automatic Wiring Setup" at Power UpOn selection of such option, the unit would perform the Automatic Wiring Setup at every Power Up of Auxiliary supply. Number of tries for Automatic Wiring& failure exit options are user defined.

Disclaimer:

The Automatic wiring Setup in case of highly fluctuating loading conditions may sometimes fail to detect the right wiring sequence. In such case it will force user to carry out the Manual Wiring Setup.

The success chances for Automatic wiring setup are lower with

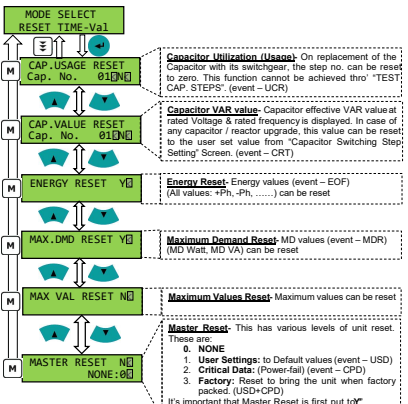
- *Load fluctuations are high and abrupt.*
- *PFC system capacitive reactive power injection capacity is far lower than the supply system loading.*

This feature therefore should be used as a convenience feature. Users are given to understand that there is a possibility of failure during Automatic Synchronization. In such case, Manual Wiring setup or the Physical Wiring change would be mandatory for PFC to carry out authentic measurement.

In case of abrupt load changing type of system, the usage of RTPFC (Real time PF correction systems) or SVG (Static VAR Generator) is recommended for better reactive power performance.

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Mode Select: Resetting Time (accumulated values)

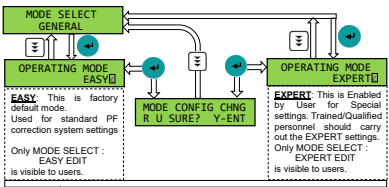


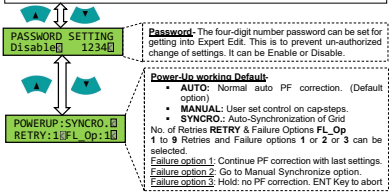
Factory Reset function should not be used under normal circumstances

All the editable parameters (user defined settings are erased permanently by Factory Reset function and these settings would be as "Factory default".

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Mode Select: General



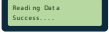


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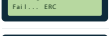
REFERENCE

Flashing Messages (Error & Status)

Memory Reading Operational Messages



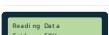
Any data read from non-volatile memory is successfully read for further usage. Normally data read is against the communication request on Com 1 or Com2 ports, or system requirements.



ERC: Calibration data read Error. It is system error. The unit would be displaying System Fault and the measurement data is likely to be inaccurate. Unit would normally correct this Error with next power up. For repeated errors seen, unit should be sent to Authorized service centre.



ERP: User Setting Parameter read error. It is Fatal Error. The unit would be displaying ...Fatal Error... The unit to be sent to Authorized service centre.

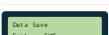


ERE: Early Warning Power Fail recovery Data read error. Aux. supply Power up, unit recovers critical retention data like Energy, Max-Values etc. When reading this data fails, gives error message for "Enter to Reset".



ERU: Unit information Data read error. The unit information data read can have errors. This error cannot be seen under normal user operations. This error can be seen only when the factory setting of unit information.

Memory Writing Operational Messages



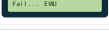
Any data saved to memory is successfully written for further usage. Data written is against the specific action like Data log request Event, Interval, Daily, Editable Parameters etc.



EWC: Calibration data write Error. This error can be seen only when the unit is written with calibration data in factory. As Calibration write records are not written in normal operation, such message would not be seen.



EWP: User Setting Parameter writing error. It is Unit level Fatal Error. The unit after multiple unsuccessful tries, does not recover. The unit is to be sent to service centre for rectification.



EWE: Early Warning Power Fail Recovery Data write error. Aux. supply Power up, unit recovers critical data. It gives error message "Enter to Reset".

EWU: Unit information Data write error. The unit information data writing can have errors. This error cannot be seen under normal user operations. This error can be seen only when the factory setting of unit information.

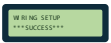
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REFERENCE

Other Operational / Informative Messages



This message appears when incorrect password is entered while getting into "Expert Edit" Menu.



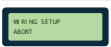
Auto Synchronization (within "Wiring Setup" or "Power up Sync") has successfully passed and unit is ready for regular operation.



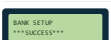
Auto Synchronization (within "Wiring Setup" or "Power up Sync") has failed and unit would take further actions as per settings.



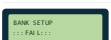
Auto Synchronization if initiated (within "Wiring Setup" or "Power up Sync") during configurations that do not support this function.



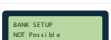
During progress of Auto Synchronization, if user aborts the process by key pressing, message is momentarily displayed.



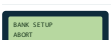
In "Easy Edit" => "Auto Configuration", displays this message when Capacitor Banks VAR values are successfully acquired.



In "Easy Edit" => "Auto Configuration", displays this message when Capacitor Banks VAR values can-not be acquired.



In "Easy Edit" => "Auto Configuration", displays this message when other settings do not permit the auto-config process.



In "Easy Edit" => "Auto Configuration", displays this message when user action of aborting the process by pressing key.

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PART FIVE

Commissioning, Maintenance & Reference

Commissioning procedure, fault-finding guidelines, the complete event / error-bit list and the MODBUS address tables.

20 Commissioning Instructions

Capacitor-Bank Configuration in the PF-Correction System

The accuracy of PF correction depends primarily on the capacitor-bank value (VAR) selection, which gives the resolution of VAR adjustment.

- ✓ Capacitor banks should always be selected in a configuration such as X1:1:2:4:8... or X1:1:3:6:12... or X1:2:4:8... This ensures the difference between any two successive combinations is "1". Other combinations like X1:3:3:4... give a difference of "2" in some cases, meaning a resolution of "2" — in which case the no-action band is set >2 to avoid hunting.
- ✓ The capacitor-bank value should be considered at the supply rated voltage (nameplate VAR may differ at different voltages).
- ✓ When harmonic-blocking (anti-resonant detuned) reactors are used, the effective value of the capacitor–reactor series combination at rated voltage should be used as the step reactive power.

Selection of System Components

A. The measurement supply rated voltage at the terminals must be within the specified range. For higher-voltage feedback, Potential Transformers (PTs) are mandatory.

B. The measurement current feedback should be a minimum Class 1 (or better) measurement-class CT with VA burden <1 VA. Use the right VA-burden CT rating per wire size and feedback length.

C. The auxiliary supply must be within 90 V~ to 485 V~. For higher-voltage systems, use a step-down transformer for the correct auxiliary voltage.

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Pre-Energizing Instructions

- ✓ CT secondary terminals (for the measurement CT) should always be kept shorted.
- ✓ Ensure the PF system is checked for all routine tests — wiring continuity and megger / HV insulation test.
- ✓ Ensure correct tightening of power-connection terminals, joints and lug crimping.
- ✓ Keep the capacitor banks disconnected (by HRC-fuse removal or SFU / MCCB / circuit breaker in the off condition).

Initial Energizing of the Control Supply

- ✓ Switch ON the control-section supply to the PF-correction system and ensure the power-on display appears.
- ✓ Pressing the LEFT key defeats capacitor discharging; adjust contrast with LEFT / RIGHT then SAVE.
- ✓ Adjust the rated supply voltage and rated supply frequency per the system requirements.
- ✓ Adjust the primary and secondary CT ratios of the measurement current and capacitor current.
- ✓ Remove the CT secondary shorting links so secondary current flows through the PFC terminals.
- ✓ For HV feedback, adjust the PT ratio and DT ratio.
- ✓ Confirm the Overall Values and Phase Values match the supply-system energy meter / load manager.
- ✓ Check all capacitor switches via TEST CAPACITOR STEPS, and ensure all capacitor VAR values are correctly entered; adjust all EDIT parameters and SAVE.

Post-Energizing Instructions

- ✓ Turn on the MCCB / breakers / fuses for the capacitor banks.
- ✓ In TEST CAPACITOR STEPS, turn ON the banks one by one and check the capacitor current in all three phases (clamp-on ammeter or PFC display) against the step VAR rating.
- ✓ In Easy Edit, set the capacitor-bank VAR values and the correct V / I feedback synchronization with AUTO CONFIG (not recommended with highly-fluctuating loads).
- ✓ Check the auxiliary-input function (ACV measurement or assigned digital function) and the assigned auxiliary outputs.
- ✓ Use SETUP WIRING (Automatic or Manual sync) and verify the per-phase active & reactive power values and their +/− signs.
- ✓ For communication, set the correct baud rate, parity and unit ID.

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- ✓ Put the unit in Automatic (Normal) operation; observe reactive-power compensation to the desired level and that the PF is near the target.
- ✓ Refine using Expert Edit: correction & discharge time, no-action band & offset. For specialised applications, study the scheme and application notes before proceeding.
- ✓ Observe the PF-correction system for good performance for a few hours.

21 Fault Finding Guidelines

Fault type	Probable reason	Action to take
Unit does not turn on	Auxiliary supply not connected; or out of range (<90 V- or >485 V~).	Check input supply for recovery; ensure the right voltage is applied to the auxiliary supply.
Unit does not switch on capacitors even though PF is below the target+PF limit	Improper voltage & current feedback synchronization; any NTRIP or JNS-X declared faults are active; or unit active power w.r.t. rated apparent power is very low.	Take various options for synchronization; clear the reasons for the detected fault; this may be OK — confirm the unit is within the no-action VAR band.
Error messages appear and go off	Check the type of error message; the causes are described in this manual.	Apply the recommended action for the given error.
Screen totally dark or totally bright with backlight ON	LCD contrast not adjusted correctly.	Use the LEFT & RIGHT arrow keys with multiple presses to resolve.
Any communication faults	Adjustment & configuration parameters incorrectly done.	Refer to the relevant details in this manual for corrective action.
RS-485 MODBUS communication is not working	Incorrect RS-485 connection practices; incorrect baud rate / settings; incorrect values seen from communication.	Refer to RS-485 connection with termination resistors, fan-out limits and distances; set the baud rate and settings per the specs; refer to the MODBUS address table and data length / conversions.
Some screens / parameters are not seen as given in the manual	Other parameter functionalities are preventing those edits or function usage.	Check the functionality preventing the edit; decide whether it is out of the product design scope by referring to this manual.
Unit totally hung; health-indication LED slow-blink not seen	Hardware error.	Replace the unit with a new one; send the faulty unit to an authorised service centre.
Unit set in Remote Mode RM1 / RM2 is not responding to user actions	This is purposeful, to prevent user intervention while in remote mode.	Wait for the timeout, or exit RM by MODBUS write. Do not power down and power up.

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Fault type	Probable reason	Action to take
Unit in Easy Edit shows AVL fault	Auxiliary Input was momentarily connected with an AC supply >60 Vac and is now disconnected.	Turn OFF the unit power supply and, after it is fully off, turn it ON. The AVL fault stays disabled until the AI is again reconnected with AC voltage.

22 Event / Fault Display & Error-Bit List

The table lists every event and fault, its LCD display code, the error-bit reference (EWx-y, where x = Fault Status 1–8 and y = bit 0–15) and the fault type. Some entries are part of the wider product line and may not apply to all C-PF12X-nnK1NMNO sub-types.

#	Event	Description	LCD	Error bit	Type
1	4GN	GPRS modem on COM1 — network weak	4GN	EW4- 15	Aux-Fault
2	ABD	Auto Configuration (Easy Edit) operational	ABD	EW7- 12	Status
3	ABP	Auto Configuration (Easy Edit) is pending	ABP	EW7- 13	Status
4	AMG	Generator Mode in enable state	AMG	EW4- 8	Status
5	ASM	Automatic Synchronization Mode (user)	ASM	EW4- 12	Status
6	ASP	Automatic Synchronizing pending	ASP	EW7- 11	Status
7	AVH	Aux. Input control AC voltage high	AVH	EW8- 14	Aux-Fault
8	AVL	Aux. Input control AC voltage low	AVL	EW8- 13	Aux-Fault
9	BDA	Auto Bank Detection Abort	BDA	EW8- 4	Status
10	BDF	Auto Bank Detection Fail	BDF	EW8- 3	Aux-Fault
11	BDP	Auto Bank Detection Pass	BDP	EW8- 5	Status
12	CBF	One or more caps faulty; bank VAR out of tolerance	CBF	EW8- 15	C-Fault
13	CEL	Capacitor earth-leakage / neutral-current fault	CEL	EW8- 7	C-Fault
14	CHB	Measurement current over harmonics — B-phase	CHF	EW6- 11	S-Fault
15	ChB	Cap. current over harmonics — B-phase	ChF	EW2- 7	C-Fault
16	CHF	Over-current harmonics in any one of three S-CTs	CHF	EW6- 9	S-Fault
17	ChF	Over-current harmonics in any one of three C-CTs	ChF	EW7- 9	C-Fault
18	CHR	Measurement current over harmonics — R-phase	CHF	EW6- 9	S-Fault
19	ChR	Cap. current over harmonics — R-phase	ChF	EW2- 5	C-Fault

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#	Event	Description	LCD	Error bit	Type
20	CHY	Measurement current over harmonics — Y-phase	CHF	EW6- 10	S-Fault
21	ChY	Cap. current over harmonics — Y-phase	ChF	EW2- 6	C-Fault
22	CMI	COM1 port RS-232 communication error	CMI	EW5- 8	Aux-Fault
23	CM2	COM2 port RS-485 communication error	CM2	EW5- 9	Aux-Fault
24	COB	Capacitor over-current — B-phase	COF	EW2- 0	C-Fault
25	COF	Over-current in any 1 of 3 C-CT	COF	EW7- 6	C-Fault
26	COR	Capacitor over-current — R-phase	COF	EW1- 12	C-Fault
27	COY	Capacitor over-current — Y-phase	COF	EW1- 14	C-Fault
28	CRT	Capacitor bank VAR values reset (log only)	CRT	EW5- 11	Status
29	CTM	Capacitor testing (manual)	CTM	EW4- 1	Status
30	CUB	Capacitor under-current — B-phase	CUF	EW2- 1	C-Fault
31	CUF	Under-current in any 1 of 3 C-CT	CUF	EW7- 7	C-Fault
32	CUR	Capacitor under-current — R-phase	CUF	EW1- 13	C-Fault
33	CUY	Capacitor under-current — Y-phase	CUF	EW1- 15	C-Fault
34	DSB	Disable status on Aux. input (or 32S-Fi on Aux. Input fn.)	DSB	EW4- 6	Status
35	EOF	Energy counters overflow event	EOF	EW4- 14	Status
36	EOT	External over-temperature (through Pt-100)	EOT	EW2- 11	Aux-Fault
37	ERC	EEPROM read error 1 — calibration data	ERC	EW5- 0	Sys-Fault
38	ERE	EEPROM read error 3 — EWPF data	ERE	EW5- 2	Sys-Fault
39	ERL	EEPROM read error 4 — logged data	ERL	EW5- 3	Sys-Fault
40	ERP	EEPROM read error 2 — parameter data	ERP	EW5- 1	Sys-Fault
41	ERU	EEPROM read error 5 — unit-info data	ERU	EW4- 2	Sys-Fault
42	EWC	EEPROM write error 1 — calibration data	EWC	EW5- 4	Sys-Fault
43	EWE	EEPROM write error 3 — EWPF data	EWE	EW5- 6	Sys-Fault
44	EWL	EEPROM write error 4 — logged data	EWL	EW5- 7	Sys-Fault
45	EWP	EEPROM write error 2 — parameter data	EWP	EW5- 5	Sys-Fault
46	EWU	EEPROM write error 5 — unit-info data	EWU	EW4- 3	Sys-Fault
47	HLD	Hold status from Aux. Input (or 32S-Mi on Aux. Input fn.)	HLD	EW4- 7	Status
48	I OK	1 am OK — no event / fault	I OK	EW6- 15	Status

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#	Event	Description	LCD	Error bit	Type
49	MAN	Power-up manual mode	MAN	EW7 - 14	Status
50	MDV	Maximum Demand (kVA) exceeded	MDV	EW8 - 3	S-Fault
51	MDW	Maximum Demand (kW) exceeded	MDW	EW8 - 2	S-Fault
52	MDT	MCU / unit interior over-temperature	MDT	EW2 - 4	Aux-Fault
53	MRT	Max. values reset (log only)	MRT	EW6 - 12	Status
54	NVF	EEPROM fault	NVF	EW2 - 15	Sys-Fault
55	OBB	Out of banks — VAR shortage — B-phase	OBF	EW6 - 14	C-Fault
56	OBF	Out of banks for any one of the phases	OBF	EW2 - 8	C-Fault
57	OBR	Out of banks — VAR shortage — R-phase	OBF	EW6 - 12	C-Fault
58	OBY	Out of banks — VAR shortage — Y-phase	OBF	EW6 - 13	C-Fault
59	OCB	Measurement over-current — B-phase	OCF	EW1 - 10	S-Fault
60	OCF	Over-current in any 1 of 3 S-CT	OCF	EW7 - 5	S-Fault
61	OCN	Measurement over-current — Neutral	OCN	EW2 - 10	S-Fault
62	OCR	Measurement over-current — R-phase	OCF	EW1 - 6	S-Fault
63	OCY	Measurement over-current — Y-phase	OCF	EW1 - 8	S-Fault
64	OVB	Measurement over-voltage — B-phase	OVF	EW1 - 4	S-Fault
65	OVF	Over-voltage in any one or three phases (L-L or L-N)	OVF	EW7 - 3	S-Fault
66	OVR	Measurement over-voltage — R-phase	OVF	EW1 - 0	S-Fault
67	OVY	Measurement over-voltage — Y-phase	OVF	EW1 - 2	S-Fault
68	PDW	Unit power-down event (log only)	PDN	EW2 - 12	Status
69	PEM	Parameter editing & configuration (not on LCD)	PEM	EW4 - 13	Status
70	PFB	Leading displacement power factor — B-phase	PFL	EW8 - 12	Status
71	PFL	Overall D-PF is leading	PFL	EW7 - 4	Status
72	PFR	Leading displacement power factor — R-phase	PFL	EW8 - 10	Status
73	PFY	Leading displacement power factor — Y-phase	PFL	EW8 - 11	Status
74	PSV	Parameters saved event (log only)	PSV	EW6 - 10	Status
75	PUP	Unit power-up event (log only)	PUP	EW2 - 13	Status
76	RMI	Operation in Remote 1 mode by COM 2	RMI	EW4 - 4	Status
77	RM2	Operation in Remote 2 mode by COM 2	RM2	EW4 - 5	Status

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#	Event	Description	LCD	Error bit	Type
78	RTC	RTC needs resetting (unit powered down for long)	RTC	EW2 - 14	Status
79	SOF	Measurement over-frequency	SOF	EW2 - 2	S-Fault
80	SUF	Measurement under-frequency	SUF	EW2 - 3	S-Fault
81	SyA	Automatic synchronization aborted by user	SyA	EW4 - 10	Status
82	SyF	Automatic synchronization failure	SyF	EW4 - 0	Aux-Fault
83	SyP	Automatic synchronization pass	SyP	EW4 - 11	Status
84	UBA	Unbalance in 3-phase measurement current	UBA	EW2 - 9	S-Fault
85	UBC	Unbalance in 3-phase capacitor current	UBC	EW3 - 5	C-Fault
86	UBV	Unbalance in 3-phase voltage	UBV	EW3 - 4	S-Fault
87	UCR	Cap. bank utilization counter reset (even 1, not on LCD)	UCR	EW5 - 13	Status
88	ULB	Measurement under-load — B-phase (i.t.o. Watt)	ULF	EW1 - 11	S-Fault
89	ULF	Active-power under-load detected in any 1 of the 3 phases	ULF	EW7 - 10	S-Fault
90	ULR	Measurement under-load — R-phase (i.t.o. Watt)	ULF	EW1 - 7	S-Fault
91	ULY	Measurement under-load — Y-phase (i.t.o. Watt)	ULF	EW1 - 9	S-Fault
92	UVB	Measurement under-voltage — B-phase	UVF	EW1 - 5	S-Fault
93	UVF	Under-voltage in any 1 or 3 phases (L-L or L-N)	UVF	EW7 - 2	S-Fault
94	UVR	Measurement under-voltage — R-phase	UVF	EW1 - 1	S-Fault
95	UVY	Measurement under-voltage — Y-phase	UVF	EW1 - 3	S-Fault
96	VBH	Meas. voltage over harmonics — B-R phases L-L voltage	VhF	EW7 - 1	S-Fault
97	VHB	Meas. voltage over harmonics — B-phase	VHF	EW6 - 8	S-Fault
98	VHF	Over-volt harmonics in any 1 of 3 phase with L-N sensing	VHF	EW8 - 8	S-Fault
99	VhF	Over-volt harmonics in any 1 of 3 phase with L-L sensing	VhF	EW7 - 8	S-Fault
100	VHR	Measurement voltage over harmonics — R-phase	VHF	EW6 - 6	S-Fault
101	VHY	Measurement voltage over harmonics — Y-phase	VHF	EW6 - 7	S-Fault
102	VOH	Voltage control — over-voltage cap remove (not available)	VOH	EW8 - 1	Status
103	VOL	Voltage control — under-voltage cap addition (not available)	VOL	EW8 - 0	Status
104	VOR	Voltage control over-ride — VAR operation (not available)	VOR	EW8 - 2	Status
105	VRH	Meas. voltage over harmonics — R-Y phases L-L voltage	VhF	EW6 - 15	S-Fault
106	VYH	Meas. voltage over harmonics — Y-B phases L-L voltage	VhF	EW7 - 0	S-Fault

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#	Event	Description	LCD	Error bit	Type
107	WDR	Watchdog-timer reset	WDR	EW4 - 9	Sys-Fault
108	W&T	Wiring position saved in Manual Sync. (not on LCD)	W&T	EW6 - 14	Status
109	ZCB	Measurement zero current — B-phase	ZCF	EW6 - 5	S-Fault
110	ZCF	Zero current detected in all three S-CT	ZCF	EW8 - 0	S-Fault
111	ZCR	Measurement zero current — R-phase	ZCF	EW6 - 3	S-Fault
112	ZCY	Measurement zero current — Y-phase	ZCF	EW6 - 4	S-Fault
113	ZVB	Measurement zero voltage — B-phase	ZVF	EW6 - 2	S-Fault
114	ZVF	Zero voltage detected in all three phases	ZVF	EW8 - 1	S-Fault
115	ZVR	Measurement zero voltage — R-phase	ZVF	EW6 - 0	S-Fault
116	ZVY	Measurement zero voltage — Y-phase	ZVF	EW6 - 1	S-Fault

23 MODBUS Address Table

The MODBUS data is divided into three parts: real-time (instantaneous) data — read-only; parameter settings (by user) — read & write; and remote-mode data — write (and read in real time). In the read-only tables, the **M3 / M4** columns indicate availability under measurement configuration 3 or 4 (1 = available). Some registers belong to the wider product line and may read "–" on the C-PF12X.

Read-Only — Display Parameters

Function code 3 (Read Holding Register). All registers: floating type.

Dec	Hex	Symbol	Description	M3	M4
40000	9C40	FREQ	Supply Frequency	**1**	**1**
40002	9C42	1V	Phase 1 to Neutral RMS Voltage	0	0
40004	9C44	2V	Phase 2 to Neutral RMS Voltage	0	0
40006	9C46	3V	Phase 3 to Neutral RMS Voltage	0	0
40008	9C48	V	Avg Phase to Neutral RMS Voltage	0	**1**
40010	9C4A	1V1	Phase 1 to N Fundamental Voltage	0	0
40012	9C4C	2V1	Phase 2 to N Fundamental Voltage	0	0
40014	9C4E	3V1	Phase 3 to N Fundamental Voltage	0	0

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Dec	Hex	Symbol	Description	M3	M4
40016	9C50	V1	Avg Phase to N Fundamental Voltage	0	**1**
40018	9C52	12V	Phase 1 to Phase 2 RMS Voltage	0	0
40020	9C54	23V	Phase 2 to Phase 3 RMS Voltage	0	0
40022	9C56	31V	Phase 3 to Phase 1 RMS Voltage	0	0
40024	9C58	VL	Avg Phase to Phase RMS Voltage	**1**	0
40026	9C5A	12V1	Phase 1 to Phase 2 Fund. Voltage	0	0
40028	9C5C	23V1	Phase 2 to Phase 3 Fund. Voltage	0	0
40030	9C5E	31V1	Phase 3 to Phase 1 Fund. Voltage	0	0
40032	9C60	VL1	Avg Phase to Phase Fund. Voltage	**1**	0
40034	9C62	1A	Phase 1 RMS Current	0	0
40036	9C64	2A	Phase 2 RMS Current	0	0
40038	9C66	3A	Phase 3 RMS Current	0	0
40040	9C68	A	Avg. Phase RMS Current	**1**	**1**
40042	9C6A	NA	Neutral RMS Current	0	0
40044	9C6C	1A1	Phase 1 Fundamental Current	0	0
40046	9C6E	2A1	Phase 2 Fundamental Current	0	0
40048	9C70	3A1	Phase 3 Fundamental Current	0	0
40050	9C72	A1	Avg. Phase Fundamental Current	**1**	**1**
40052	9C74	NA1	Neutral Fundamental Current	0	0
40054	9C76	1CA	Phase 1 RMS Capacitor Current	–	–
40056	9C78	2CA	Phase 2 RMS Capacitor Current	–	–
40058	9C7A	3CA	Phase 3 RMS Capacitor Current	–	–
40060	9C7C	CA	Avg. Phase RMS Capacitor Current	–	–
40062	9C7E	NCA	Capacitor Neutral / Earth Leakage Current	–	–
40064	9C80	1CA1	Phase 1 Fundamental Capacitor Current	–	–
40066	9C82	2CA1	Phase 2 Fundamental Capacitor Current	–	–
40068	9C84	3CA1	Phase 3 Fundamental Capacitor Current	–	–
40070	9C86	CA1	Avg. Phase Fund. Capacitor Current	–	–
40072	9C88	1P	Phase 1 RMS Active Power	0	0

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Dec	Hex	Symbol	Description	M3	M4
40016	9C50	V1	Avg Phase to N Fundamental Voltage	0	1
40018	9C52	12V	Phase 1 to Phase 2 RMS Voltage	0	0
40020	9C54	23V	Phase 2 to Phase 3 RMS Voltage	0	0
40022	9C56	31V	Phase 3 to Phase 1 RMS Voltage	0	0
40024	9C58	VL	Avg Phase to Phase RMS Voltage	1	0
40026	9C5A	12V1	Phase 1 to Phase 2 Fund. Voltage	0	0
40028	9C5C	23V1	Phase 2 to Phase 3 Fund. Voltage	0	0
40030	9C5E	31V1	Phase 3 to Phase 1 Fund. Voltage	0	0
40032	9C60	VL1	Avg Phase to Phase Fund. Voltage	1	0
40034	9C62	1A	Phase 1 RMS Current	0	0
40036	9C64	2A	Phase 2 RMS Current	0	0
40038	9C66	3A	Phase 3 RMS Current	0	0
40040	9C68	A	Avg. Phase RMS Current	1	1
40042	9C6A	NA	Neutral RMS Current	0	0
40044	9C6C	1A1	Phase 1 Fundamental Current	0	0
40046	9C6E	2A1	Phase 2 Fundamental Current	0	0
40048	9C70	3A1	Phase 3 Fundamental Current	0	0
40050	9C72	A1	Avg. Phase Fundamental Current	1	1
40052	9C74	NA1	Neutral Fundamental Current	0	0
40054	9C76	1CA	Phase 1 RMS Capacitor Current	–	–
40056	9C78	2CA	Phase 2 RMS Capacitor Current	–	–
40058	9C7A	3CA	Phase 3 RMS Capacitor Current	–	–
40060	9C7C	CA	Avg. Phase RMS Capacitor Current	–	–
40062	9C7E	NCA	Capacitor Neutral / Earth Leakage Current	–	–
40064	9C80	1CA1	Phase 1 Fundamental Capacitor Current	–	–
40066	9C82	2CA1	Phase 2 Fundamental Capacitor Current	–	–
40068	9C84	3CA1	Phase 3 Fundamental Capacitor Current	–	–
40070	9C86	CA1	Avg. Phase Fund. Capacitor Current	–	–
40072	9C88	1P	Phase 1 RMS Active Power	0	0

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Dec	Hex	Symbol	Description	M3	M4
40074	9C8A	2P	Phase 2 RMS Active Power	0	0
40076	9C8C	3P	Phase 3 RMS Active Power	0	0
40078	9C8E	P	Total RMS Active Power	1	1
40080	9C90	1P1	Phase 1 Fundamental Active Power	0	0
40082	9C92	2P1	Phase 2 Fundamental Active Power	0	0
40084	9C94	3P1	Phase 3 Fundamental Active Power	0	0
40086	9C96	P1	Total fundamental Active Power	1	1
40088	9C98	1Q	Phase 1 RMS Reactive Power	0	0
40090	9C9A	2Q	Phase 2 RMS Reactive Power	0	0
40092	9C9C	3Q	Phase 3 RMS Reactive Power	0	0
40094	9C9E	Q	Total RMS Reactive Power	1	1
40096	9CA0	1Q1	Phase 1 Fundamental Reactive Power	0	0
40098	9CA2	2Q1	Phase 2 Fundamental Reactive Power	0	0
40100	9CA4	3Q1	Phase 3 Fundamental Reactive Power	0	0
40102	9CA6	Q1	Total RMS Reactive Power	1	1
40104	9CA8	1S	Phase 1 RMS Apparent Power	0	0
40106	9CAA	2S	Phase 2 RMS Apparent Power	0	0
40108	9CAC	3S	Phase 3 RMS Apparent Power	0	0
40110	9CAE	S	Total RMS Apparent Power	1	1
40112	9CB0	1S1	Phase 1 Fundamental Apparent Power	0	0
40114	9CB2	2S1	Phase 2 Fundamental Apparent Power	0	0
40116	9CB4	3S1	Phase 3 Fundamental Apparent Power	0	0
40118	9CB6	S1	Total RMS Reactive Power	1	1
40120	9CB8	1CV	Phase 1 to N RMS Cap. Volt (DT ratio > 1)	0	0
40122	9CBA	2CV	Phase 2 to N RMS Cap. Volt (DT ratio > 1)	0	0
40124	9CBC	3CV	Phase 3 to N RMS Cap. Volt (DT ratio > 1)	0	0
40126	9CBE	CV	Avg Ph to N RMS Cap. Volt (DT ratio > 1)	1	1
40128	9CC0	1CV1	Ph 1 to N Fund. Cap. Volt (DT ratio > 1)	0	0
40130	9CC2	2CV1	Ph 2 to N Fund. Cap. Volt (DT ratio > 1)	0	0

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Dec	Hex	Symbol	Description	M3	M4
40132	9CC4	3CV1	Ph 3 to N Fund. Cap. Volt (DT ratio > 1)	0	0
40134	9CC6	CV1	Avg Ph to N Fund. Cap. Volt (DT ratio > 1)	1	1
40136	9CC8	1CS	Phase 1 to Neutral RMS Apparent Power	0	0
40138	9CCA	2CS	Phase 2 to Neutral RMS Apparent Power	0	0
40140	9CCC	3CS	Phase 3 to Neutral RMS Apparent Power	0	0
40142	9CCE	CS	Avg Ph to Neutral RMS Apparent Power	1	1
40144	9CD0	1CS1	Phase 1 to Neutral Fund. Apparent Power	0	0
40146	9CD2	2CS1	Phase 2 to Neutral Fund. Apparent Power	0	0
40148	9CD4	3CS1	Phase 3 to Neutral Fund. Apparent Power	0	0
40150	9CD6	CS1	Avg Ph to Neutral Fund. Apparent Power	1	1
40152	9CD8	1PF	Phase 1 Power Factor - RMS	0	0
40154	9CDA	2PF	Phase 2 Power Factor - RMS	0	0
40156	9CDC	3PF	Phase 3 Power Factor - RMS	0	0
40158	9CDE	PF	Overall Power Factor - RMS	1	1
40160	9CE0	1DPF	Phase 1 Displacement Power Factor	0	0
40162	9CE2	2DPF	Phase 2 Displacement Power Factor	0	0
40164	9CE4	3DPF	Phase 3 Displacement Power Factor	0	0
40166	9CE6	DPF	Overall Displacement Power Factor	0	1
40168	9CE8	1PF_LC	Ph 1 Power Factor Inductive or Capacitive	0	0
40170	9CEA	2PF_LC	Ph 2 Power Factor Inductive or Capacitive	0	0
40172	9CEC	3PF_LC	Ph 3 Power Factor Inductive or Capacitive	0	0
40174	9CEE	PF_LC	Overall Power Factor Ind. or Cap.	1	0
40176	9CF0	1DPF_LC	Ph1 DPF Ind. or Cap.	0	0
40178	9CF2	2DPF_LC	Ph2 DPF Ind. or Cap.	1	1
40180	9CF4	3DPF_LC	Ph3 DPF Ind. or Cap.	0	0
40182	9CF6	DPF_LC	Overall DPF Inductive or Capacitive	1	1
40184	9CF8	HR	Time - Hour	–	–
40186	9CFA	MIN	Time - Minutes	–	–
40188	9CFC	SEC	Time - Seconds	–	–

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Dec	Hex	Symbol	Description	M3	M4
40190	9CFE	N/A	N/A	–	–
40192	9D00	DD	Date - Day	–	–
40194	9D02	MM	Date - Month	–	–
40196	9D04	YYYY	Date - Year	–	–
40198	9D06	N/A	N/A	–	–
40200	9D08	F_Min	Min Frequency	**1**	**1**
40202	9D0A	1V_Max	Max Phase 1 to Neutral RMS Voltage	0	**1**
40204	9D0C	2V_Max	Max Phase 2 to Neutral RMS Voltage	0	0
40206	9D0E	3V_Max	Max Phase 3 to Neutral RMS Voltage	0	0
40208	9D10	N/A	N/A	–	–
40210	9D12	N/A	N/A	–	–
40212	9D14	N/A	N/A	–	–
40214	9D16	N/A	N/A	–	–
40216	9D18	N/A	N/A	–	–
40218	9D1A	12V_Max	Max Phase 1 to Phase 2 RMS Voltage	0	0
40220	9D1C	23V_Max	Max Phase 2 to Phase 3 RMS Voltage	**1**	0
40222	9D1E	31V_Max	Max Phase 3 to Phase 1 RMS Voltage	0	0
40224	9D20	N/A	N/A	–	–
40226	9D22	N/A	N/A	–	–
40228	9D24	N/A	N/A	–	–
40230	9D26	N/A	N/A	–	–
40232	9D28	N/A	N/A	–	–
40234	9D2A	1A_Max	Max Phase 1 RMS Current	**1**	**1**
40236	9D2C	2A_Max	Max Phase 2 RMS Current	0	0
40238	9D2E	3A_Max	Max Phase 3 RMS Current	0	0
40240	9D30	N/A	N/A	–	–
40242	9D32	N/A	N/A	–	–
40244	9D34	N/A	N/A	–	–
40246	9D36	N/A	N/A	–	–

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Dec	Hex	Symbol	Description	M3	M4
40248	9D38	N/A	N/A	–	–
40250	9D3A	N/A	N/A	–	–
40252	9D3C	N/A	N/A	–	–
40254	9D3E	1CA_Max	Max Phase 1 RMS Capacitor Current	–	–
40256	9D40	2CA_Max	Max Phase 2 RMS Capacitor Current	–	–
40258	9D42	3CA_Max	Max Phase 3 RMS Capacitor Current	–	–
40260	9D44	N/A	N/A	–	–
40262	9D46	N/A	N/A	–	–
40264	9D48	N/A	N/A	–	–
40266	9D4A	N/A	N/A	–	–
40268	9D4C	N/A	N/A	–	–
40270	9D4E	N/A	N/A	–	–
40272	9D50	1P_I MP_Max	Max Phase 1 RMS Import Active Power	0	0
40274	9D52	2P_I MP_Max	Max Phase 2 RMS Import Active Power	0	0
40276	9D54	3P_I MP_Max	Max Phase 3 RMS Import Active Power	0	0
40278	9D56	P_I MP_Max	Max Total RMS Import Active Power	**1**	**1**
40280	9D58	1P_EXP_Max	Max Phase 1 RMS Export Active Power	0	0
40282	9D5A	2P_EXP_Max	Max Phase 2 RMS Export Active Power	0	0
40284	9D5C	3P_EXP_Max	Max Phase 3 RMS Export Active Power	0	0
40286	9D5E	P_EXP_Max	Max Total RMS Reactive Power	**1**	**1**
40288	9D60	1QI_I MP_Max	Max Ph 1 Fund. Inductive Reactive Power	0	0
40290	9D62	2QI_I MP_Max	Max Ph 2 Fund. Inductive Reactive Power	0	0
40292	9D64	3QI_I MP_Max	Max Ph 3 Fund. Inductive Reactive Power	0	0
40294	9D66	Q1_I MP_Max	Max Total Fund. Inductive Reactive Power	**1**	**1**
40296	9D68	1QI_EXP_Max	Max Ph 1 Fund. Cap. Reactive Power	0	0
40298	9D6A	2QI_EXP_Max	Max Ph 2 Fund. Cap. Reactive Power	0	0
40300	9D6C	3QI_EXP_Max	Max Ph 3 Fund. Cap. Reactive Power	0	0
40302	9D6E	QI_EXP_Max	Max Total Fund. Cap. Reactive Power	**1**	**1**
40304	9D70	1S_Max	Max Phase 1 RMS Import Apparent Power	0	0

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Dec	Hex	Symbol	Description	M3	M4
40306	9D72	2S_Max	Max Phase 2 RMS Import Apparent Power	0	0
40308	9D74	3S_Max	Max Phase 3 RMS Import Apparent Power	0	0
40310	9D76	S_Max	Max Total RMS Import Apparent Power	**1**	**1**
40312	9D78	1S_EXP_Max	Max Phase 1 RMS Export Apparent Power	0	0
40314	9D7A	2S_EXP_Max	Max Phase 2 RMS Export Apparent Power	0	0
40316	9D7C	3S_EXP_Max	Max Phase 3 RMS Export Apparent Power	0	0
40318	9D7E	S_EXP_Max	Max Total RMS Export Apparent Power	**1**	**1**
40320	9D80	N/A	N/A	–	–
40322	9D82	N/A	N/A	–	–
40324	9D84	N/A	N/A	–	–
40326	9D86	N/A	N/A	–	–
40328	9D88	N/A	N/A	–	–
40330	9D8A	N/A	N/A	–	–
40332	9D8C	N/A	N/A	–	–
40334	9D8E	N/A	N/A	–	–
40336	9D90	N/A	N/A	–	–
40338	9D92	N/A	N/A	–	–
40340	9D94	N/A	N/A	–	–
40342	9D96	N/A	N/A	–	–
40344	9D98	N/A	N/A	–	–
40346	9D9A	N/A	N/A	–	–
40348	9D9C	N/A	N/A	–	–
40350	9D9E	N/A	N/A	–	–
40352	9DA0	N/A	N/A	–	–
40354	9DA2	N/A	N/A	–	–
40356	9DA4	N/A	N/A	–	–
40358	9DA6	N/A	N/A	–	–
40360	9DA8	N/A	N/A	–	–
40362	9DAA	N/A	N/A	–	–

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Dec	Hex	Symbol	Description	M3	M4
40364	9DAC	N/ A	N/A	–	–
40366	9DAE	N/ A	N/A	–	–
40368	9DB0	MDW	Max Demand (kW)	1	1
40370	9DB2	MDV	Max Demand (kVAr)	1	1
40372	9DB4	FB1	Fault Status 1 ** (refer meaning)	1	1
40374	9DB6	FB2	Fault Status 2 ** (refer meaning)	1	1
40376	9DB8	FB3	Fault Status 3 ** (refer meaning)	1	1
40378	9DBA	FB4	Fault Status 4 ** (refer meaning)	1	1
40380	9DBC	FB5	Fault Status 5 ** (refer meaning)	1	1
40382	9DBE	FB6	Fault Status 6 ** (refer meaning)	1	1
40384	9DC0	FB7	Fault Status 7 ** (refer meaning)	1	1
40386	9DC2	FB8	Fault Status 8 ** (refer meaning)	1	1
40388	9DC4	CVAR1	Cap. Step1 kVAr	1	1
40390	9DC6	CVAR2	Cap. Step2 kVAr	1	1
40392	9DC8	CVAR3	Cap. Step3 kVAr	1	1
40394	9DCA	CVAR4	Cap. Step4 kVAr	1	1
40396	9DCC	CVAR5	Cap. Step5 kVAr	1	1
40398	9DCE	CVAR6	Cap. Step6 kVAr	1	1
40400	9DD0	CVAR7	Cap. Step7 kVAr	1	1
40402	9DD2	CVAR8	Cap. Step8 kVAr	1	1
40404	9DD4	CVAR9	Cap. Step9 kVAr	1	1
40406	9DD6	CVAR10	Cap. Step10 kVAr	1	1
40408	9DD8	CVAR11	Cap. Step11 kVAr	1	1
40410	9DDA	CVAR12	Cap. Step12 kVAr	1	1
40412	9DDC	CVAR13	Cap. Step13 kVAr	1	1
40414	9DDE	CVAR14	Cap. Step14 kVAr	1	1
40416	9DE0	CVAR15	Cap. Step15 kVAr	1	1
40418	9DE2	CVAR16	Cap. Step16 kVAr	1	1
40420	9DE4	UC1	Usage Count of Step 1	1	1

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Dec	Hex	Symbol	Description	M3	M4
40422	9DE6	UC2	Usage Count of Step 2	1	1
40424	9DE8	UC3	Usage Count of Step 3	1	1
40426	9DEA	UC4	Usage Count of Step 4	1	1
40428	9DEC	UC5	Usage Count of Step 5	1	1
40430	9DEE	UC6	Usage Count of Step 6	1	1
40432	9DF0	UC7	Usage Count of Step 7	1	1
40434	9DF2	UC8	Usage Count of Step 8	1	1
40436	9DF4	UC9	Usage Count of Step 9	1	1
40438	9DF6	UC10	Usage Count of Step 10	1	1
40440	9DF8	UC11	Usage Count of Step 11	1	1
40442	9DFA	UC12	Usage Count of Step 12	1	1
40444	9DFC	UC13	Usage Count of Step 13	1	1
40446	9DFE	UC14	Usage Count of Step 14	1	1
40448	9E00	UC15	Usage Count of Step 15	1	1
40450	9E02	UC16	Usage Count of Step 16	1	1
40452	9E04	SCp1	Status Of Capacitor Step 1 * (refer meaning)	1	1
40454	9E06	SCp2	Status Of Capacitor Step 2 * (refer meaning)	1	1
40456	9E08	SCp3	Status Of Capacitor Step 3 * (refer meaning)	1	1
40458	9E0A	SCp4	Status Of Capacitor Step 4 * (refer meaning)	1	1
40460	9E0C	SCp5	Status Of Capacitor Step 5 * (refer meaning)	1	1
40462	9E0E	SCp6	Status Of Capacitor Step 6 * (refer meaning)	1	1
40464	9E10	SCp7	Status Of Capacitor Step 7 * (refer meaning)	1	1
40466	9E12	SCp8	Status Of Capacitor Step 8 * (refer meaning)	1	1
40468	9E14	SCp9	Status Of Capacitor Step 9 * (refer meaning)	1	1
40470	9E16	SCp10	Status Of Capacitor Step 10 *(refer meaning)	1	1
40472	9E18	SCp11	Status Of Capacitor Step 11 *(refer meaning)	1	1
40474	9E1A	SCp12	Status Of Capacitor Step 12 *(refer meaning)	1	1
40476	9E1C	SCp13	Status Of Capacitor Step 13 *(refer meaning)	1	1
40478	9E1E	SCp14	Status Of Capacitor Step 14 *(refer meaning)	1	1

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Dec	Hex	Symbol	Description	M3	M4
40480	9E20	SCp15	Status Of Capacitor Step 15 *(refer meaning)	1	1
40482	9E22	SCp16	Status Of Capacitor Step 16 *(refer meaning)	1	1
40484	9E24	ACV	Aux. Input Voltage	–	–
40486	9E26	ACVS	Aux. Input Status	–	–
40488	9E28	GPRS_SI G	GPRS Signal Level	–	–
40490	9E2A	I NTR_PTR	Interval Log Pointer	–	–
40492	9E2C	EVT_PTR	Event Log Pointer	–	–
40494	9E2E	DAY_PTR	Daily Log Pointer	–	–
40496	9E30	GPRS_I NTR_PTR	GPRS Sending Interval Log Pointer	–	–
40498	9E32	GPRS_EVT_PTR	GPRS Sending Event Log Pointer	–	–
40500	9E34	GPRS_DAY_PTR	GPRS Sending Daily Log Pointer	–	–
40502	9E36	MCU_T	MCU Internal Temperature	–	–
40504	9E38	EXT_T	PT100 External Temperature	–	–
40506	9E3A	1V_THDF	THDF of Phase 1 to Neutral Voltage	0	1
40508	9E3C	2V_THDF	THDF of Phase 2 to Neutral Voltage	0	0
40510	9E3E	3V_THDF	THDF of Phase 3 to Neutral Voltage	0	0
40512	9E40	V_THDF	THDF of Avg Phase to Neutral Voltage	1	1
40514	9E42	12V_THDF	THDF of Phase 1 to Phase 2 Voltage	0	0
40516	9E44	23V_THDF	THDF of Phase 2 to Phase 3 Voltage	1	0
40518	9E46	31V_THDF	THDF of Phase 3 to Phase 1 Voltage	0	0
40520	9E48	VL_THDF	THDF of Avg Phase to Phase Voltage	1	0
40522	9E4A	1A_THDF	THDF of Phase 1 Current	1	1
40524	9E4C	2A_THDF	THDF of Phase 2 Current	0	0
40526	9E4E	3A_THDF	THDF of Phase 3 Current	0	0
40528	9E50	A_THDF	THDF of Avg Phase Current	1	1
40530	9E52	N/ A	N/A	–	–
40532	9E54	1CA_THDF	THDF of Phase 1 Capacitor Current	–	–
40534	9E56	2CA_THDF	THDF of Phase 2 Capacitor Current	–	–
40536	9E58	3CA_THDF	THDF of Phase 3 Capacitor Current	–	–

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Dec	Hex	Symbol	Description	M3	M4
40538	9E5A	CA_THDF	THDF of Avg Phase Capacitor Current	–	–
40540	9E5C	N/ A	N/A	–	–
40542	9E5E	1D	Phase 1 Distortion Power	0	0
40544	9E60	2D	Phase 2 Distortion Power	0	0
40546	9E62	3D	Phase 3 Distortion Power	0	0
40548	9E64	D	Total Distortion Power	**1**	**1**
40550	9E66	1Dx	Phase 1 Cross Distortion Power	0	0
40552	9E68	2Dx	Phase 2 Cross Distortion Power	0	0
40554	9E6A	3Dx	Phase 3 Cross Distortion Power	0	0
40556	9E6C	Dx	Phase 1 Cross Distortion Power	**1**	**1**
40558	9E6E	1V_Per_THDF	THDF % of Phase 1 to Neutral Voltage	0	0
40560	9E70	2V_Per_THDF	THDF % of Phase 2 to Neutral Voltage	0	0
40562	9E72	3V_Per_THDF	THDF % of Phase 3 to Neutral Voltage	0	0
40564	9E74	V_Per_THDF	THDF % of Avg Phase to Neutral Voltage	0	**1**
40566	9E76	12V_Per_THDF	THDF % of Phase 1 to Phase 2 Voltage	0	0
40568	9E78	23V_Per_THDF	THDF % of Phase 2 to Phase 3 Voltage	0	0
40570	9E7A	31V_Per_THDF	THDF % of Phase 3 to Phase 1 Voltage	0	0
40572	9E7C	VL_Per_THDF	THDF % of Avg Phase to Phase Voltage	**1**	0
40574	9E7E	1A_Per_THDF	THDF % of Phase 1 Current	**1**	**1**
40576	9E80	2A_Per_THDF	THDF % of Phase 2 Current	0	0
40578	9E82	3A_Per_THDF	THDF % of Phase 3 Current	0	0
40580	9E84	A_Per_THDF	THDF % of Avg Phase Current	**1**	**1**
40582	9E86	NA_Per_THDF	THDF % of Neutral Current	–	–
40584	9E88	1CA_Per_THDF	THDF % of Phase 1 Capacitor Current	–	–
40586	9E8A	2CA_Per_THDF	THDF % of Phase 2 Capacitor Current	–	–
40588	9E8C	3CA_Per_THDF	THDF % of Phase 3 Capacitor Current	–	–
40590	9E8E	CA_Per_THDF	THDF % of Avg Phase Capacitor Current	–	–
40592	9E90	NCA_Per_THDF	THDF % of Capacitor Neutral Current	–	–
40594	9E92	1A_Per_TDD	TDD % of Phase 1 Current	**1**	**1**

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Dec	Hex	Symbol	Description	M3	M4
40596	9E94	2A_Per_TDD	TDD % of Phase 2 Current	0	0
40598	9E96	3A_Per_TDD	TDD % of Phase 3 Current	0	0
40600	9E98	A_Per_TDD	TDD % of Avg Phase Current	1	1
40602	9E9A	NA_Per_TDD	TDD % of Neutral Current	–	–
40604	9E9C	1CA_Per_TDD	TDD % of Phase 1 Capacitor Current	–	–
40606	9E9E	2CA_Per_TDD	TDD % of Phase 2 Capacitor Current	–	–
40608	9EA0	3CA_Per_TDD	TDD % of Phase 3 Capacitor Current	–	–
40610	9EA2	CA_Per_TDD	TDD of Avg Phase Capacitor Current	–	–
40612	9EA4	NCA_Per_TDD	TDD % of Capacitor Neutral Current	–	–
40614	9EA6	AUX_OUT1_St at	Auxiliary Output 1 status	–	–
40616	9EA8	AUX_OUT2_St at	Auxiliary Output 2 status	–	–
40618	9EAA	AUX_OUT3_St at	Auxiliary Output 3 status	–	–

CAPACITOR BANK STATUS (SCP)

0 Not Used · 1 Bank OFF · 2 Bank ON · 3 Bank Discharging · 4 Faulty · 5 Fix OFF · 6 FIX ON · 7 FIX Discharging · 8 FIX Faulty · 9 Utilization Limit reached.

FAULT STATUS (FB1–FB8)

Floating-point values — convert to 16-bit binary for bitwise information. Example: FB1 (reg 40372) = 65 → 0000 0000 0100 0001 → bits 0 & 6 set → (EW1-0) OVR, (EW1-6) OCR present. In EWx-y, x = Fault Status 1–8, y = bit 0–15.

Read-Only — Energy (64-bit Long Integer)

Function code 3. Energy values use 64-bit registers (16-bit × 4 words) to avoid the truncation errors of floating-point format.

Dec	Hex	Symbol	Description	M3	M4
42014	A41E	IMP_Ph_Grid	RMS Active Energy import from Grid (KWh)	1	1
42018	A422	EXP_Ph_Grid	RMS Active Energy export to Grid (KWh)	1	1
42022	A426	IMP_Ph_Gen	RMS Active Energy import from Generator (KWh)	1	1
42026	A42A	EXP_Ph_Gen	RMS Active Energy export to Generator (KWh)	1	1
42030	A42E	IMP_Ph1_Grid	Fund. Active Energy import from Grid (KWh)	1	1
42034	A432	EXP_Ph1_Grid	Fund. Active Energy export to Grid (KWh)	1	1

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Dec	Hex	Symbol	Description	M3	M4
42038	A436	I_MP_Ph1_Gen	Fund. Active Energy import from Generator(KWh)	1	1
42042	A43A	EXP_Ph1_Gen	Fund. Active Energy export to Generator (KWh)	1	1
42046	A43E	I_MP_Qh1_Grid	Fund. Reactive Energy import from Grid (KVARh)	1	1
42050	A442	EXP_Qh1_Grid	Fund. Reactive Energy export to Grid (KVARh)	1	1
42054	A446	I_MP_Qh1_Gen	Fund. Reactive Energy import from Gen.(KVARh)	1	1
42058	A44A	EXP_Qh1_Gen	Fund. Reactive Energy export to Gen.(KVARh)	1	1
42062	A44E	Sh_Grid	RMS Apparent Energy with Grid (KVAh)	1	1
42066	A452	Sh1_Grid	Fund. Apparent Energy with Grid (KVAh)	1	1
42070	A456	Sh_Gen	RMS Apparent Energy with Generator (KVAh)	1	1
42074	A45A	Sh1_Gen	Fund. Apparent Energy with Generator (KVAh)	1	1
42078	A45E	CQh_Grid	Capacitor Reactive Energy on Grid by PFC (KVARh)	1	1
42082	A462	DSh_Grid	Distortion Energy with Grid (KVAh)	1	1
42086	A466	CQh_Gen	Capacitor Reactive Energy Gen. by PFC (KVARh)	1	1
42090	A46A	DSh_Gen	Distortion Energy with Generator (KVAh)	1	1

Read-Only — Unit Information

Function code 3. All registers are 32-bit long-integer type.

Dec	Hex	Symbol	Description
43000	A7F8	Sr_NUM_1_4	1 to 4 Characters of Product Serial Number
43002	A7FA	Sr_NUM_5_8	5 to 8 Characters of Product Serial Number
43004	A7FC	Sr_NUM_9_12	9 to 12 Characters of Product Serial Number
43006	A7FE	Sr_NUM_13_16	13 to 16 Characters of Product Serial Number
43008	A800	PD_CODE_1_4	1 to 4 Characters of Product Code
43010	A802	PD_CODE_5_8	5 to 8 Characters of Product Code
43012	A804	PD_CODE_9_12	9 to 12 Characters of Product Code
43014	A806	PD_CODE_13_16	13 to 16 Characters of Product Code
43016	A808	PD_VER_1_4	1 to 4 Characters of Product SW Version Number
43018	A80A	PD_VER_5_8	5 to 8 Characters of Product SW Version Number
43020	A80C	PD_VER_9_12	9 to 12 Characters of Product SW Version Number

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Dec	Hex	Symbol	Description
43022	A80E	PD_VER_13_16	13 to 16 Characters of Product SW Version Number

Write & Read — User Setting Parameters (Easy / Expert Edit)

Function code 4 (Read / Write Input Registers). All registers are 32-bit long. Access: RW.

Dec	Hex	Symbol	Description
30000	7530	ES_EnDx	Easy Setup Enable/Disable Config
30002	7532	ES_RV_LL	Easy Setup Rated Voltage Line to Line
30004	7534	ES_Freq	Easy Setup Rated Frequency
30006	7536	ES_SPri	Easy Setup Supply CT Primary Amps
30008	7538	ES_SSec	Easy Setup Supply CT Secondary Amps
30010	753A	ES_CPri	Easy Setup Capacitor CT Primary Amps
30012	753C	ES_CSec	Easy Setup Capacitor CT Secondary Amps
30014	753E	ES_STEP1	Easy Setup Step 1 kVAr
30016	7540	ES_STEP2	Easy Setup Step 2 kVAr
30018	7542	ES_STEP3	Easy Setup Step 3 kVAr
30020	7544	ES_STEP4	Easy Setup Step 4 kVAr
30022	7546	ES_STEP5	Easy Setup Step 5 kVAr
30024	7548	ES_STEP6	Easy Setup Step 6 kVAr
30026	754A	ES_STEP7	Easy Setup Step 7 kVAr
30028	754C	ES_STEP8	Easy Setup Step 8 kVAr
30030	754E	ES_STEP9	Easy Setup Step 9 kVAr
30032	7550	ES_STEP10	Easy Setup Step 10 kVAr
30034	7552	ES_STEP11	Easy Setup Step 11 kVAr
30036	7554	ES_STEP12	Easy Setup Step 12 kVAr
30038	7556	ES_STEP13	Easy Setup Step 13 kVAr
30040	7558	ES_STEP14	Easy Setup Step 14 kVAr
30042	755A	ES_STEP15	Easy Setup Step 15 kVAr
30044	755C	ES_STEP16	Easy Setup Step 16 kVAr
30046	755E	ES_Target	Easy Setup Target DPF

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Doc	Hex	Symbol	Description
30048	7560	ES_Target_Sign	Easy Setup Target DPF Sign (0-Capacitive, 1-Inductive)
30050	7562	Step_Control 1	Manual PROG Step Control
30052	7564	STEP1_UsageR	Step 1 Usages Reset
30054	7566	STEP2_UsageR	Step 2 Usages Reset
30056	7568	STEP3_UsageR	Step 3 Usages Reset
30058	756A	STEP4_UsageR	Step 4 Usages Reset
30060	756C	STEP5_UsageR	Step 5 Usages Reset
30062	756E	STEP6_UsageR	Step 6 Usages Reset
30064	7570	STEP7_UsageR	Step 7 Usages Reset
30066	7572	STEP8_UsageR	Step 8 Usages Reset
30068	7574	STEP9_UsageR	Step 9 Usages Reset
30070	7576	STEP10_UsageR	Step 10 Usages Reset
30072	7578	STEP11_UsageR	Step 11 Usages Reset
30074	757A	STEP12_UsageR	Step 12 Usages Reset
30076	757C	STEP13_UsageR	Step 13 Usages Reset
30078	757E	STEP14_UsageR	Step 14 Usages Reset
30080	7580	STEP15_UsageR	Step 15 Usages Reset
30082	7582	STEP16_UsageR	Step 16 Usages Reset
30084	7584	STEP1_Val R	Step 1 Value Reset
30086	7586	STEP2_Val R	Step 2 Value Reset
30088	7588	STEP3_Val R	Step 3 Value Reset
30090	758A	STEP4_Val R	Step 4 Value Reset
30092	758C	STEP5_Val R	Step 5 Value Reset
30094	758E	STEP6_Val R	Step 6 Value Reset
30096	7590	STEP7_Val R	Step 7 Value Reset
30098	7592	STEP8_Val R	Step 8 Value Reset
30100	7594	STEP9_Val R	Step 9 Value Reset
30102	7596	STEP10_Val R	Step 10 Value Reset
30104	7598	STEP11_Val R	Step 11 Value Reset

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Dec	Hex	Symbol	Description
30106	759A	STEP12_Val R	Step 12 Value Reset
30108	759C	STEP13_Val R	Step 13 Value Reset
30110	759E	STEP14_Val R	Step 14 Value Reset
30112	75A0	STEP15_Val R	Step 15 Value Reset
30114	75A2	STEP16_Val R	Step 16 Value Reset
30116	75A4	Energy_Rst	Energy Reset
30118	75A6	Energy_RHr	Energy Reset Hr
30120	75A8	Energy_RMn	Energy Reset Min
30122	75AA	Energy_Rday	Energy Reset Date
30124	75AC	MD_Rst	Max. Demand Reset
30126	75AE	MD_RHr	Max. Demand Reset Hr
30128	75B0	MD_RMn	Max. Demand Reset Min
30130	75B2	MD_Rday	Max. Demand Reset Date
30132	75B4	MAX_Rst	Max. Value Reset
30134	75B6	MAX_RHr	Max. Value Reset Hr
30136	75B8	MAX_RMn	Max. Value Reset Min
30138	75BA	MAX_Rday	Max. Value Reset Date
30140	75BC	Data_LogR	Data Logging Erase
30142	75BE	Fact_R	Factory Default
30144	75C0	WP1	Phase 1 Wiring Position
30146	75C2	WP1_Sign	Phase 1 Wiring Position Sign
30148	75C4	WP2	Phase 2 Wiring Position
30150	75C6	WP2_Sign	Phase 2 Wiring Position Sign
30152	75C8	WP3	Phase 3 Wiring Position
30154	75CA	WP3_Sign	Phase 3 Wiring Position Sign
30156	75CC	WP1	Phase 1 Cap. Wiring Position
30158	75CE	WP1_Sign	Phase 1 Cap. Wiring Position Sign
30160	75D0	WP2	Phase 2 Cap. Wiring Position
30162	75D2	WP2_Sign	Phase 2 Cap. Wiring Position Sign

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Dec	Hex	Symbol	Description
30164	75D4	WP3	Phase 3 Cap. Wiring Position
30166	75D6	WP3_Si gn	Phase 3 Cap. Wiring Position Sign
30168	75D8	Aut o	Setup Auto Sync. Start
30170	75DA	EX_RV	Expert Setup Mains VA Config
30172	75DC	EX_RV_Type	Expert Setup Cap. CT Config
30174	75DE	EX_RV	Expert Setup Rated Voltage
30176	75E0	EX_RV_Type	Expert Setup Rated Voltage Type
30178	75E2	EX_PTR	Expert Setup PT Ratio
30180	75E4	EX_DTR	Expert Setup DT Ratio
30182	75E6	EX_SPri	Expert Setup Supply CT Primary Amps
30184	75E8	EX_SSec	Expert Setup Supply CT Secondary Amps
30186	75EA	EX_CPri	Expert Setup Capacitor CT Primary Amps
30188	75EC	EX_CSec	Expert Setup Capacitor CT Secondary Amps
30190	75EE	EX_Freq	Expert Setup Rated Frequency
30192	75F0	VECTER_GP	VA-Vector Group
30194	75F2	MD_WI	MD_Window Time (Min)
30196	75F4	EX_MTar get	Expert Setup Mains Target DPF
30198	75F6	EX_MTar get _Si gn	Expert Setup Mains Target DPF Sign (0-Capacitive, 1-Inductive)
30200	75F8	EX_GTar get	Expert Setup Generator Target DPF
30202	75FA	EX_GTar get _Si gn	Expert Setup Generator Target DPF Sign (0-Cap., 1-Ind.)
30204	75FC	RES	Correction Resolution (multiplying factor to smallest bank)
30206	75FE	OFF	Offset
30208	7600	CRR_Ti me	Correction Time
30210	7602	CRR_Type	Correction Type
30212	7604	DI S_Ti me	Discharge Time
30214	7606	I NT_Ti me	Interleaving Time
30216	7608	CFG_Type	Step Config Type
30218	760A	EX_STEP1	Expert Setup Step 1 VAr
30220	760C	EX_STEP2	Expert Setup Step 2 VAr

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Dec	Hex	Symbol	Description
30222	760E	EX_STEP3	Expert Setup Step 3 VAr
30224	7610	EX_STEP4	Expert Setup Step 4 VAr
30226	7612	EX_STEP5	Expert Setup Step 5 VAr
30228	7614	EX_STEP6	Expert Setup Step 6 VAr
30230	7616	EX_STEP7	Expert Setup Step 7 VAr
30232	7618	EX_STEP8	Expert Setup Step 8 VAr
30234	761A	EX_STEP9	Expert Setup Step 9 VAr
30236	761C	EX_STEP10	Expert Setup Step 10 VAr
30238	761E	EX_STEP11	Expert Setup Step 11 VAr
30240	7620	EX_STEP12	Expert Setup Step 12 VAr
30242	7622	EX_STEP13	Expert Setup Step 13 VAr
30244	7624	EX_STEP14	Expert Setup Step 14 VAr
30246	7626	EX_STEP15	Expert Setup Step 15 VAr
30248	7628	EX_STEP16	Expert Setup Step 16 VAr
30250	762A	EX_STEP1_Uni t	Expert Setup Step 1 VAr Unit
30252	762C	EX_STEP2_Uni t	Expert Setup Step 2 VAr Unit
30254	762E	EX_STEP3_Uni t	Expert Setup Step 3 VAr Unit
30256	7630	EX_STEP4_Uni t	Expert Setup Step 4 VAr Unit
30258	7632	EX_STEP5_Uni t	Expert Setup Step 5 VAr Unit
30260	7634	EX_STEP6_Uni t	Expert Setup Step 6 VAr Unit
30262	7636	EX_STEP7_Uni t	Expert Setup Step 7 VAr Unit
30264	7638	EX_STEP8_Uni t	Expert Setup Step 8 VAr Unit
30266	763A	EX_STEP9_Uni t	Expert Setup Step 9 VAr Unit
30268	763C	EX_STEP10_Uni t	Expert Setup Step 10 VAr Unit
30270	763E	EX_STEP11_Uni t	Expert Setup Step 11 VAr Unit
30272	7640	EX_STEP12_Uni t	Expert Setup Step 12 VAr Unit
30274	7642	EX_STEP13_Uni t	Expert Setup Step 13 VAr Unit
30276	7644	EX_STEP14_Uni t	Expert Setup Step 14 VAr Unit
30278	7646	EX_STEP15_Uni t	Expert Setup Step 15 VAr Unit

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Dec	Hex	Symbol	Description
30280	7648	EX_STEP16_Unit	Expert Setup Step 16 VAr Unit
30282	764A	EX_STEP1_Type	Expert Setup Step 1 Type
30284	764C	EX_STEP2_Type	Expert Setup Step 2 Type
30286	764E	EX_STEP3_Type	Expert Setup Step 3 Type
30288	7650	EX_STEP4_Type	Expert Setup Step 4 Type
30290	7652	EX_STEP5_Type	Expert Setup Step 5 Type
30292	7654	EX_STEP6_Type	Expert Setup Step 6 Type
30294	7656	EX_STEP7_Type	Expert Setup Step 7 Type
30296	7658	EX_STEP8_Type	Expert Setup Step 8 Type
30298	765A	EX_STEP9_Type	Expert Setup Step 9 Type
30300	765C	EX_STEP10_Type	Expert Setup Step 10 Type
30302	765E	EX_STEP11_Type	Expert Setup Step 11 Type
30304	7660	EX_STEP12_Type	Expert Setup Step 12 Type
30306	7662	EX_STEP13_Type	Expert Setup Step 13 Type
30308	7664	EX_STEP14_Type	Expert Setup Step 14 Type
30310	7666	EX_STEP15_Type	Expert Setup Step 15 Type
30312	7668	EX_STEP16_Type	Expert Setup Step 16 Type
30314	766A	HLT1_CHK	Step 1 Health Check Enable
30316	766C	HLT1_CHK_ULimit	Step 1 Health Check Upper Limit
30318	766E	HLT1_CHK_LLimit	Step 1 Health Check Lower Limit
30320	7670	HLT2_CHK	Step 2 Health Check Enable
30322	7672	HLT2_CHK_ULimit	Step 2 Health Check Upper Limit
30324	7674	HLT2_CHK_LLimit	Step 2 Health Check Lower Limit
30326	7676	HLT3_CHK	Step 3 Health Check Enable
30328	7678	HLT3_CHK_ULimit	Step 3 Health Check Upper Limit
30330	767A	HLT3_CHK_LLimit	Step 3 Health Check Lower Limit
30332	767C	HLT4_CHK	Step 4 Health Check Enable
30334	767E	HLT4_CHK_ULimit	Step 4 Health Check Upper Limit
30336	7680	HLT4_CHK_LLimit	Step 4 Health Check Lower Limit

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Dec	Hex	Symbol	Description
30338	7682	HLT5_CHK	Step 5 Health Check Enable
30340	7684	HLT5_CHK_ULimit	Step 5 Health Check Upper Limit
30342	7686	HLT5_CHK_LLimit	Step 5 Health Check Lower Limit
30344	7688	HLT6_CHK	Step 6 Health Check Enable
30346	768A	HLT6_CHK_ULimit	Step 6 Health Check Upper Limit
30348	768C	HLT6_CHK_LLimit	Step 6 Health Check Lower Limit
30350	768E	HLT7_CHK	Step 7 Health Check Enable
30352	7690	HLT7_CHK_ULimit	Step 7 Health Check Upper Limit
30354	7692	HLT7_CHK_LLimit	Step 7 Health Check Lower Limit
30356	7694	HLT8_CHK	Step 8 Health Check Enable
30358	7696	HLT8_CHK_ULimit	Step 8 Health Check Upper Limit
30360	7698	HLT8_CHK_LLimit	Step 8 Health Check Lower Limit
30362	769A	HLT9_CHK	Step 9 Health Check Enable
30364	769C	HLT9_CHK_ULimit	Step 9 Health Check Upper Limit
30366	769E	HLT9_CHK_LLimit	Step 9 Health Check Lower Limit
30368	76A0	HLT10_CHK	Step 10 Health Check Enable
30370	76A2	HLT10_CHK_ULimit	Step 10 Health Check Upper Limit
30372	76A4	HLT10_CHK_LLimit	Step 10 Health Check Lower Limit
30374	76A6	HLT11_CHK	Step 11 Health Check Enable
30376	76A8	HLT11_CHK_ULimit	Step 11 Health Check Upper Limit
30378	76AA	HLT11_CHK_LLimit	Step 11 Health Check Lower Limit
30380	76AC	HLT12_CHK	Step 12 Health Check Enable
30382	76AE	HLT12_CHK_ULimit	Step 12 Health Check Upper Limit
30384	76B0	HLT12_CHK_LLimit	Step 12 Health Check Lower Limit
30386	76B2	HLT13_CHK	Step 13 Health Check Enable
30388	76B4	HLT13_CHK_ULimit	Step 13 Health Check Upper Limit
30390	76B6	HLT13_CHK_LLimit	Step 13 Health Check Lower Limit
30392	76B8	HLT14_CHK	Step 14 Health Check Enable
30394	76BA	HLT14_CHK_ULimit	Step 14 Health Check Upper Limit

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Dec	Hex	Symbol	Description
30454	76F6	USGI 2_CHK	Step 12 Usage Check Enable/Disable
30456	76F8	USGI 2_CHK_Li mi t	Step 12 Usage Check Limit
30458	76FA	USGI 3_CHK	Step 13 Usage Check Enable/Disable
30460	76FC	USGI 3_CHK_Li mi t	Step 13 Usage Check Limit
30462	76FE	USGI 4_CHK	Step 14 Usage Check Enable/Disable
30464	7700	USGI 4_CHK_Li mi t	Step 14 Usage Check Limit
30466	7702	USGI 5_CHK	Step 15 Usage Check Enable/Disable
30468	7704	USGI 5_CHK_Li mi t	Step 15 Usage Check Limit
30470	7706	USGI 6_CHK	Step 16 Usage Check Enable/Disable
30472	7708	USGI 6_CHK_Li mi t	Step 16 Usage Check Limit
30474	770A	USG_CDI V	Step Usage Calculation - Step ON/OFF Count Div Fact
30476	770C	USG_TDI V	Step Usage Calculation - Step ON Time Div Fact
30478	770E	EVT1_EnDs	Fault 1 Enable/Disable
30480	7710	EVE1_ACT	Fault 1 Action
30482	7712	EVE1_LMT	Fault 1 Set Limit
30484	7714	EVE1_RES	Fault 1 Resume Limit
30486	7716	EVE1_TYPE	Fault 1 Resume Method
30488	7718	EVE1_DLY	Fault 1 Resume Delay in Sec
30490	771A	EVT2_EnDs	Fault 2 Enable/Disable
30492	771C	EVE2_ACT	Fault 2 Action
30494	771E	EVE2_LMT	Fault 2 Set Limit
30496	7720	EVE2_RES	Fault 2 Resume Limit
30498	7722	EVE2_TYPE	Fault 2 Resume Method
30500	7724	EVE2_DLY	Fault 2 Resume Delay in Sec
30502	7726	EVT3_EnDs	Fault 3 Enable/Disable
30504	7728	EVE3_ACT	Fault 3 Action
30506	772A	EVE3_LMT	Fault 3 Set Limit
30508	772C	EVE3_RES	Fault 3 Resume Limit
30510	772E	EVE3_TYPE	Fault 3 Resume Method

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Dec	Hex	Symbol	Description
30396	76BC	HLT14_CHK_LLimit	Step 14 Health Check Lower Limit
30398	76BE	HLT15_CHK	Step 15 Health Check Enable
30400	76C0	HLT15_CHK_ULimit	Step 15 Health Check Upper Limit
30402	76C2	HLT15_CHK_LLimit	Step 15 Health Check Lower Limit
30404	76C4	HLT16_CHK	Step 16 Health Check Enable
30406	76C6	HLT16_CHK_ULimit	Step 16 Health Check Upper Limit
30408	76C8	HLT16_CHK_LLimit	Step 16 Health Check Lower Limit
30410	76CA	USG1_CHK	Step 1 Usage Check Enable/Disable
30412	76CC	USG1_CHK_Limit	Step 1 Usage Check Limit
30414	76CE	USG2_CHK	Step 2 Usage Check Enable/Disable
30416	76D0	USG2_CHK_Limit	Step 2 Usage Check Limit
30418	76D2	USG3_CHK	Step 3 Usage Check Enable/Disable
30420	76D4	USG3_CHK_Limit	Step 3 Usage Check Limit
30422	76D6	USG4_CHK	Step 4 Usage Check Enable/Disable
30424	76D8	USG4_CHK_Limit	Step 4 Usage Check Limit
30426	76DA	USG5_CHK	Step 5 Usage Check Enable/Disable
30428	76DC	USG5_CHK_Limit	Step 5 Usage Check Limit
30430	76DE	USG6_CHK	Step 6 Usage Check Enable/Disable
30432	76E0	USG6_CHK_Limit	Step 6 Usage Check Limit
30434	76E2	USG7_CHK	Step 7 Usage Check Enable/Disable
30436	76E4	USG7_CHK_Limit	Step 7 Usage Check Limit
30438	76E6	USG8_CHK	Step 8 Usage Check Enable/Disable
30440	76E8	USG8_CHK_Limit	Step 8 Usage Check Limit
30442	76EA	USG9_CHK	Step 9 Usage Check Enable/Disable
30444	76EC	USG9_CHK_Limit	Step 9 Usage Check Limit
30446	76EE	USG10_CHK	Step 10 Usage Check Enable/Disable
30448	76F0	USG10_CHK_Limit	Step 10 Usage Check Limit
30450	76F2	USG11_CHK	Step 11 Usage Check Enable/Disable
30452	76F4	USG11_CHK_Limit	Step 11 Usage Check Limit

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Dec	Hex	Symbol	Description
30454	76F6	USG12_CHK	Step 12 Usage Check Enable/Disable
30456	76F8	USG12_CHK_Limit	Step 12 Usage Check Limit
30458	76FA	USG13_CHK	Step 13 Usage Check Enable/Disable
30460	76FC	USG13_CHK_Limit	Step 13 Usage Check Limit
30462	76FE	USG14_CHK	Step 14 Usage Check Enable/Disable
30464	7700	USG14_CHK_Limit	Step 14 Usage Check Limit
30466	7702	USG15_CHK	Step 15 Usage Check Enable/Disable
30468	7704	USG15_CHK_Limit	Step 15 Usage Check Limit
30470	7706	USG16_CHK	Step 16 Usage Check Enable/Disable
30472	7708	USG16_CHK_Limit	Step 16 Usage Check Limit
30474	770A	USG_CDIV	Step Usage Calculation - Step ON/OFF Count Div Fact
30476	770C	USG_TDIV	Step Usage Calculation - Step ON Time Div Fact
30478	770E	EVT1_EnDs	Fault 1 Enable/Disable
30480	7710	EVE1_ACT	Fault 1 Action
30482	7712	EVE1_LMT	Fault 1 Set Limit
30484	7714	EVE1_RES	Fault 1 Resume Limit
30486	7716	EVE1_TYPE	Fault 1 Resume Method
30488	7718	EVE1_DLY	Fault 1 Resume Delay in Sec
30490	771A	EVT2_EnDs	Fault 2 Enable/Disable
30492	771C	EVE2_ACT	Fault 2 Action
30494	771E	EVE2_LMT	Fault 2 Set Limit
30496	7720	EVE2_RES	Fault 2 Resume Limit
30498	7722	EVE2_TYPE	Fault 2 Resume Method
30500	7724	EVE2_DLY	Fault 2 Resume Delay in Sec
30502	7726	EVT3_EnDs	Fault 3 Enable/Disable
30504	7728	EVE3_ACT	Fault 3 Action
30506	772A	EVE3_LMT	Fault 3 Set Limit
30508	772C	EVE3_RES	Fault 3 Resume Limit
30510	772E	EVE3_TYPE	Fault 3 Resume Method

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Dec	Hex	Symbol	Description
30512	7730	EVE3_DLY	Fault 3 Resume Delay in Sec
30514	7732	EVT4_EnDs	Fault 4 Enable/Disable
30516	7734	EVE4_ACT	Fault 4 Action
30518	7736	EVE4_LMT	Fault 4 Set Limit
30520	7738	EVE4_RES	Fault 4 Resume Limit
30522	773A	EVE4_TYPE	Fault 4 Resume Method
30524	773C	EVE4_DLY	Fault 4 Resume Delay in Sec
30526	773E	EVT5_EnDs	Fault 5 Enable/Disable
30528	7740	EVE5_ACT	Fault 5 Action
30530	7742	EVE5_LMT	Fault 5 Set Limit
30532	7744	EVE5_RES	Fault 5 Resume Limit
30534	7746	EVE5_TYPE	Fault 5 Resume Method
30536	7748	EVE5_DLY	Fault 5 Resume Delay in Sec
30538	774A	EVT6_EnDs	Fault 6 Enable/Disable
30540	774C	EVE6_ACT	Fault 6 Action
30542	774E	EVE6_LMT	Fault 6 Set Limit
30544	7750	EVE6_RES	Fault 6 Resume Limit
30546	7752	EVE6_TYPE	Fault 6 Resume Method
30548	7754	EVE6_DLY	Fault 6 Resume Delay in Sec
30550	7756	EVT7_EnDs	Fault 7 Enable/Disable
30552	7758	EVE7_ACT	Fault 7 Action
30554	775A	EVE7_LMT	Fault 7 Set Limit
30556	775C	EVE7_RES	Fault 7 Resume Limit
30558	775E	EVE7_TYPE	Fault 7 Resume Method
30560	7760	EVE7_DLY	Fault 7 Resume Delay in Sec
30562	7762	EVT8_EnDs	Fault 8 Enable/Disable
30564	7764	EVE8_ACT	Fault 8 Action
30566	7766	EVE8_LMT	Fault 8 Set Limit
30568	7768	EVE8_RES	Fault 8 Resume Limit

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Dec	Hex	Symbol	Description
30628	77A4	EVE13_RES	Fault 13 Resume Limit
30630	77A6	EVE13_TYPE	Fault 13 Resume Method
30632	77A8	EVE13_DLY	Fault 13 Resume Delay in Sec
30634	77AA	EVT14_EnDs	Fault 14 Enable/Disable
30636	77AC	EVE14_ACT	Fault 14 Action
30638	77AE	EVE14_LMT	Fault 14 Set Limit
30640	77B0	EVE14_RES	Fault 14 Resume Limit
30642	77B2	EVE14_TYPE	Fault 14 Resume Method
30644	77B4	EVE14_DLY	Fault 14 Resume Delay in Sec
30646	77B6	EVT15_EnDs	Fault 15 Enable/Disable
30648	77B8	EVE15_ACT	Fault 15 Action
30650	77BA	EVE15_LMT	Fault 15 Set Limit
30652	77BC	EVE15_RES	Fault 15 Resume Limit
30654	77BE	EVE15_TYPE	Fault 15 Resume Method
30656	77C0	EVE15_DLY	Fault 15 Resume Delay in Sec
30658	77C2	EVT16_EnDs	Fault 16 Enable/Disable
30660	77C4	EVE16_ACT	Fault 16 Action
30662	77C6	EVE16_LMT	Fault 16 Set Limit
30664	77C8	EVE16_RES	Fault 16 Resume Limit
30666	77CA	EVE16_TYPE	Fault 16 Resume Method
30668	77CC	EVE16_DLY	Fault 16 Resume Delay in Sec
30670	77CE	EVT17_EnDs	Fault 17 Enable/Disable
30672	77D0	EVE17_ACT	Fault 17 Action
30674	77D2	EVE17_LMT	Fault 17 Set Limit
30676	77D4	EVE17_RES	Fault 17 Resume Limit
30678	77D6	EVE17_TYPE	Fault 17 Resume Method
30680	77D8	EVE17_DLY	Fault 17 Resume Delay in Sec
30682	77DA	EVT18_EnDs	Fault 18 Enable/Disable
30684	77DC	EVE18_ACT	Fault 18 Action

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Dec	Hex	Symbol	Description
30686	77DE	EVE18_LMT	Fault 18 Set Limit
30688	77E0	EVE18_RES	Fault 18 Resume Limit
30690	77E2	EVE18_TYPE	Fault 18 Resume Method
30692	77E4	EVE18_DLY	Fault 18 Resume Delay in Sec
30694	77E6	EVT19_EnDs	Fault 19 Enable/Disable
30696	77E8	EVE19_ACT	Fault 19 Action
30698	77EA	EVE19_LMT	Fault 19 Set Limit
30700	77EC	EVE19_RES	Fault 19 Resume Limit
30702	77EE	EVE19_TYPE	Fault 19 Resume Method
30704	77F0	EVE19_DLY	Fault 19 Resume Delay in Sec
30706	77F2	EVT20_EnDs	Fault 20 Enable/Disable
30708	77F4	EVE20_ACT	Fault 20 Action
30710	77F6	EVE20_LMT	Fault 20 Set Limit
30712	77F8	EVE20_RES	Fault 20 Resume Limit
30714	77FA	EVE20_TYPE	Fault 20 Resume Method
30716	77FC	EVE20_DLY	Fault 20 Resume Delay in Sec
30718	77FE	EVT21_EnDs	Fault 21 Enable/Disable
30720	7800	EVE21_ACT	Fault 21 Action
30722	7802	EVE21_LMT	Fault 21 Set Limit
30724	7804	EVE21_RES	Fault 21 Resume Limit
30726	7806	EVE21_TYPE	Fault 21 Resume Method
30728	7808	EVE21_DLY	Fault 21 Resume Delay in Sec
30730	780A	EVT22_EnDs	Fault 22 Enable/Disable
30732	780C	EVE22_ACT	Fault 22 Action
30734	780E	EVE22_LMT	Fault 22 Set Limit
30736	7810	EVE22_RES	Fault 22 Resume Limit
30738	7812	EVE22_TYPE	Fault 22 Resume Method
30740	7814	EVE22_DLY	Fault 22 Resume Delay in Sec
30742	7816	EVT23_EnDs	Fault 23 Enable/Disable

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Dec	Hex	Symbol	Description
30744	7818	EVE23_ACT	Fault 23 Action
30746	781A	EVE23_LMT	Fault 23 Set Limit
30748	781C	EVE23_RES	Fault 23 Resume Limit
30750	781E	EVE23_TYPE	Fault 23 Resume Method
30752	7820	EVE23_DLY	Fault 23 Resume Delay in Sec
30754	7822	EVT24_EnDs	Fault 24 Enable/Disable
30756	7824	EVE24_ACT	Fault 24 Action
30758	7826	EVE24_LMT	Fault 24 Set Limit
30760	7828	EVE24_RES	Fault 24 Resume Limit
30762	782A	EVE24_TYPE	Fault 24 Resume Method
30764	782C	EVE24_DLY	Fault 24 Resume Delay in Sec
30766	782E	EVT25_EnDs	Fault 25 Enable/Disable
30768	7830	EVE25_ACT	Fault 25 Action
30770	7832	EVE25_LMT	Fault 25 Set Limit
30772	7834	EVE25_RES	Fault 25 Resume Limit
30774	7836	EVE25_TYPE	Fault 25 Resume Method
30776	7838	EVE25_DLY	Fault 25 Resume Delay in Sec
30778	783A	EVT26_EnDs	Fault 26 Enable/Disable
30780	783C	EVE26_ACT	Fault 26 Action
30782	783E	EVE26_LMT	Fault 26 Set Limit
30784	7840	EVE26_RES	Fault 26 Resume Limit
30786	7842	EVE26_TYPE	Fault 26 Resume Method
30788	7844	EVE26_DLY	Fault 26 Resume Delay in Sec
30790	7846	EVT27_EnDs	Fault 27 Enable/Disable
30792	7848	EVE27_ACT	Fault 27 Action
30794	784A	EVE27_LMT	Fault 27 Set Limit
30796	784C	EVE27_RES	Fault 27 Resume Limit
30798	784E	EVE27_TYPE	Fault 27 Resume Method
30800	7850	EVE27_TYPE	Fault 27 Resume Delay in Sec

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Dec	Hex	Symbol	Description
30802	7852	AUX_I N1_Fun	Aux. Input 1 Function
30804	7854	AUX_OUT1_Fun	Aux. Output 1 Function
30806	7856	AUX_OUT2_Fun	Aux. Output 2 Function
30808	7858	AUX_OUT3_Fun	Aux. Output 3 Function
30810	785A	COM1_PROTOCOL	Com1 RS232 Protocol
30812	785C	COM1_BUAD	Com1 RS232 Baud rate
30814	785E	COM1_I D	Com1 RS232 ID
30816	7860	APN_SEL	GPRS APN FIX APN Select
30818	7862	APN_OTHR	APN Other than Pre-Fix List
30820	7864	MDN	Main Domain Name
30822	7866	SDN	Sub Domain Name
30824	7868	I P_ADD	IP Address
30826	786A	PORT	Port Number
30828	786C	BUST_MODE	Bust Data Mode Enable/Disable
30830	786E	BUST_MODE_I N	Bust Data Mode Interval Time(Speed)
30832	7870	COM2_PROTOCOL	Com2 RS485 Protocol
30834	7872	COM2_BUAD	Com2 RS485 Baud rate
30836	7874	COM2_I D	Com2 RS485 ID
30838	7876	DL_I NT_Ti me	Data Logging Interval Time
30840	7878	LOG_LEN	Log Frame Length
30842	787A	PASS_EnDs	Password Enable/Disable
30844	787C	PASS	Password
30846	787E	SET_Dat e	Set Date
30848	7880	SET_MM	Set Month
30850	7882	SET_YYYY	Set Year
30852	7884	SET_CAL	Set Enable/Disable
30854	7886	SET_HR	Set Hour
30856	7888	SET_MN	Set Min
30858	788A	SET_YYYY	Set Sec

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Dec	Hex	Symbol	Description
30860	788C	SET_TIME	Set Enable/Disable
30862	788E	REM_UPDATE	Remote Update Enable/Disable
30864	7890	PCR_MODE	Power Up Mode
30866	7892	PCR_ASYN_RY	Power On Sync.. Number of Retry
30868	7894	PCR_ASYN_FLACT	Power On Sync.. Action on Failure
30870	7896	REM_MODE	Remote Operation Mode
30872	7898	REM_TIMEOUT	Remote Operation TIMEOUT
30874	789A	REM_TIMACT	Remote Operation Timeout Action
30876	789C	LNG	Language Select
30878	789E	SAVE	Save Parameters
30880	78A0	SAVE_Status	Save Parameters Ack

Remote Mode Parameters

Function code 4. Floating type. Set in the user parameter settings; PF-correction action then depends on the remote-mode parameters written.

Dec	Hex	Symbol	Description
32000	7D00	RM1_FRQ	Remote Mode 1 Freq
32004	7D04	RM1_1V1	Remote Mode 1 Phase 1 to Neutral Fundamental Voltage
32008	7D08	RM1_2V1	Remote Mode 1 Phase 2 to Neutral Fundamental Voltage
32012	7D0C	RM1_3V1	Remote Mode 1 Phase 3 to Neutral Fundamental Voltage
32016	7D10	RM1_12V1	Remote Mode 1 Phase 1 to Phase 2 Fundamental Voltage
32020	7D14	RM1_23V1	Remote Mode 1 Phase 2 to Neutral Fundamental Voltage
32024	7D18	RM1_31V1	Remote Mode 1 Phase 3 to Neutral Fundamental Voltage
32028	7D1C	RM1_1P1	Remote Mode 1 Phase 1 Fundamental Active Power
32032	7D20	RM1_2P1	Remote Mode 1 Phase 2 Fundamental Active Power
32036	7D24	RM1_3P1	Remote Mode 1 Phase 3 Fundamental Active Power
32040	7D28	RM1_1Q1	Remote Mode 1 Phase 1 Fundamental Reactive Power
32044	7D2C	RM1_2Q1	Remote Mode 1 Phase 2 Fundamental Reactive Power
32048	7D30	RM1_3Q1	Remote Mode 1 Phase 3 Fundamental Reactive Power
32100	7D64	RM2_CMD_01	Remote Mode 2 Manual command for step 1

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Dec	Hex	Symbol	Description
32102	7D66	RM2_CMD_02	Remote Mode 2 Manual command for step 2
32104	7D68	RM2_CMD_03	Remote Mode 2 Manual command for step 3
32106	7D6A	RM2_CMD_04	Remote Mode 2 Manual command for step 4
32108	7D6C	RM2_CMD_05	Remote Mode 2 Manual command for step 5
32110	7D6E	RM2_CMD_06	Remote Mode 2 Manual command for step 6
32112	7D70	RM2_CMD_07	Remote Mode 2 Manual command for step 7
32114	7D72	RM2_CMD_08	Remote Mode 2 Manual command for step 8
32116	7D74	RM2_CMD_09	Remote Mode 2 Manual command for step 9
32118	7D76	RM2_CMD_10	Remote Mode 2 Manual command for step 10
32120	7D78	RM2_CMD_11	Remote Mode 2 Manual command for step 11
32122	7D7A	RM2_CMD_12	Remote Mode 2 Manual command for step 12
32124	7D7C	RM2_CMD_13	Remote Mode 2 Manual command for step 13
32126	7D7E	RM2_CMD_14	Remote Mode 2 Manual command for step 14
32128	7D80	RM2_CMD_15	Remote Mode 2 Manual command for step 15
32130	7D82	RM2_CMD_16	Remote Mode 2 Manual command for step 16

24 Contact Details

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